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America's Triumph at PANAMA

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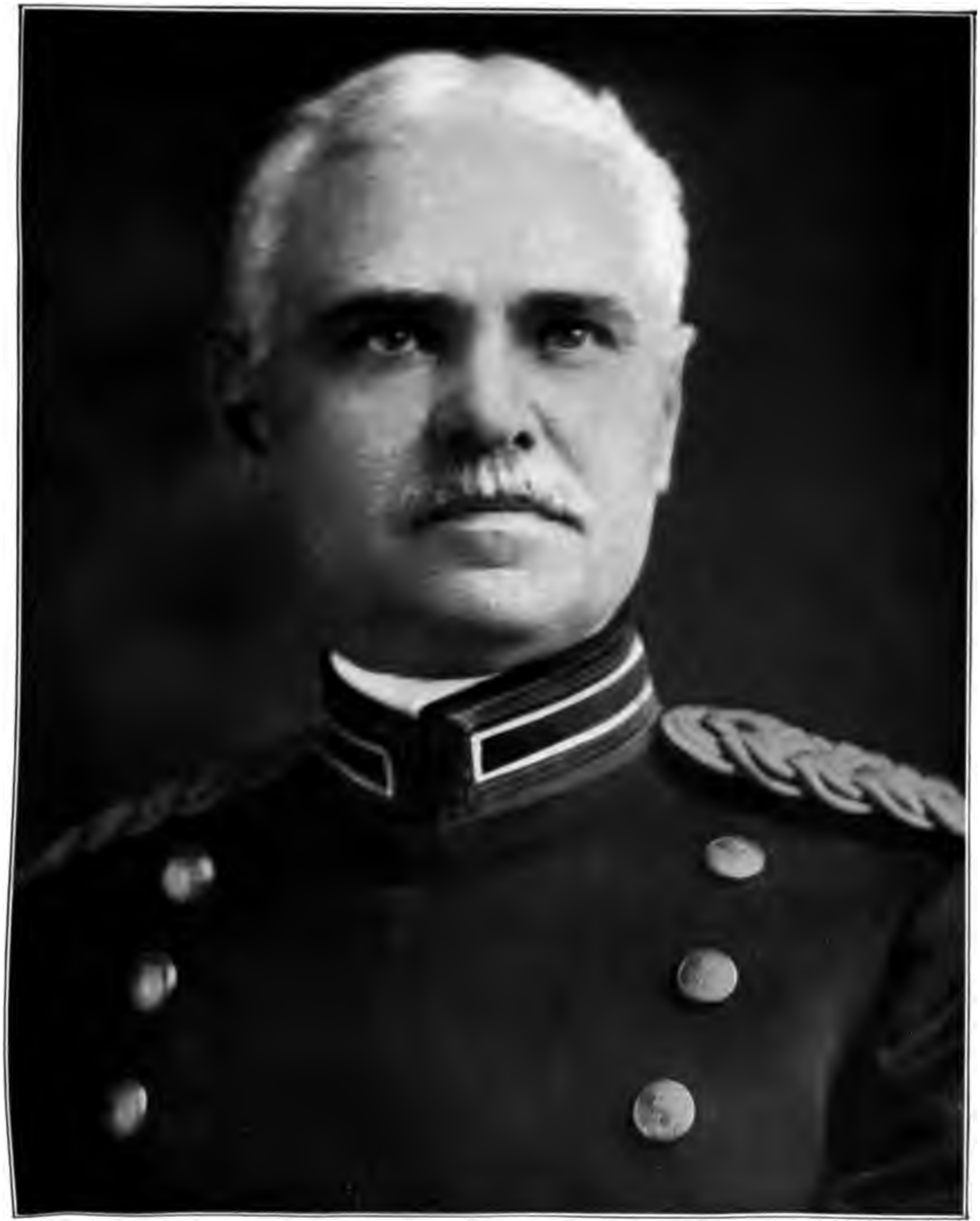

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COLONEL GEORGE WASHINGTON GOETHALS,
THE BUILDER OF THE PANAMA CANAL,

Who might be classed as the most absolute despot on earth, although a benevolent one, and the squarest boss a man ever worked for. He is a thorough engineer, a righteous judge, and a stern executioner rolled into one. He realizes that man is but human, and for simple infractions of the rules, is always ready to give the offender another chance, but there will be no second time. A man of prodigious memory, quick to grasp details be they trivial affairs of every day life, or questions of moment; an ear for every one, and the friend of all. The American Nation owes much to the men who rendered yeoman service on the Isthmus; they cannot be too highly rewarded. It owes much to that peerless leader, George Washington Goethals, who, for over six long years has kept the goal steadily in sight, who has never, for a single instant, permitted his determination to waver, who has fought inch by inch until every obstacle has been overcome, and who, through his forceful personality and sense of justice, has compelled the admiration of everyone with whom he has come in contact.

AMERICA'S TRIUMPH
AT
PANAMA

PANORAMA AND STORY OF THE CONSTRUCTION AND OPERATION OF THE WORLD'S GIANT WATERWAY FROM OCEAN TO OCEAN

By RALPH EMMETT AVERY
AUTHOR OF
A TRIP TO THE PANAMA CANAL

EDITED BY
WILLIAM C. HASKINS
OF THE CANAL RECORD

THE L. W. WALTER COMPANY,
633 PLYMOUTH COURT,
CHICAGO, ILL.

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by
RALPH E. AVERY

Dedicated to the
Men of Brain and Brawn of Our Country, Whose
Matchless Skill and Inspiring Courage
Made the Dream of Ages a Reality
in the Construction of the
Panama Canal

"Away down south in the Torrid Zone,
North latitude nearly nine,
Where eight months' pour once past and o'er
The sun four months doth shine;
Where 'tis eighty six the year around,
And people rarely agree;
Where the plaintain grows and the hot wind blows,
Lies the Land of the Cocoanut Tree."
—Gilbert.

FOREWORD

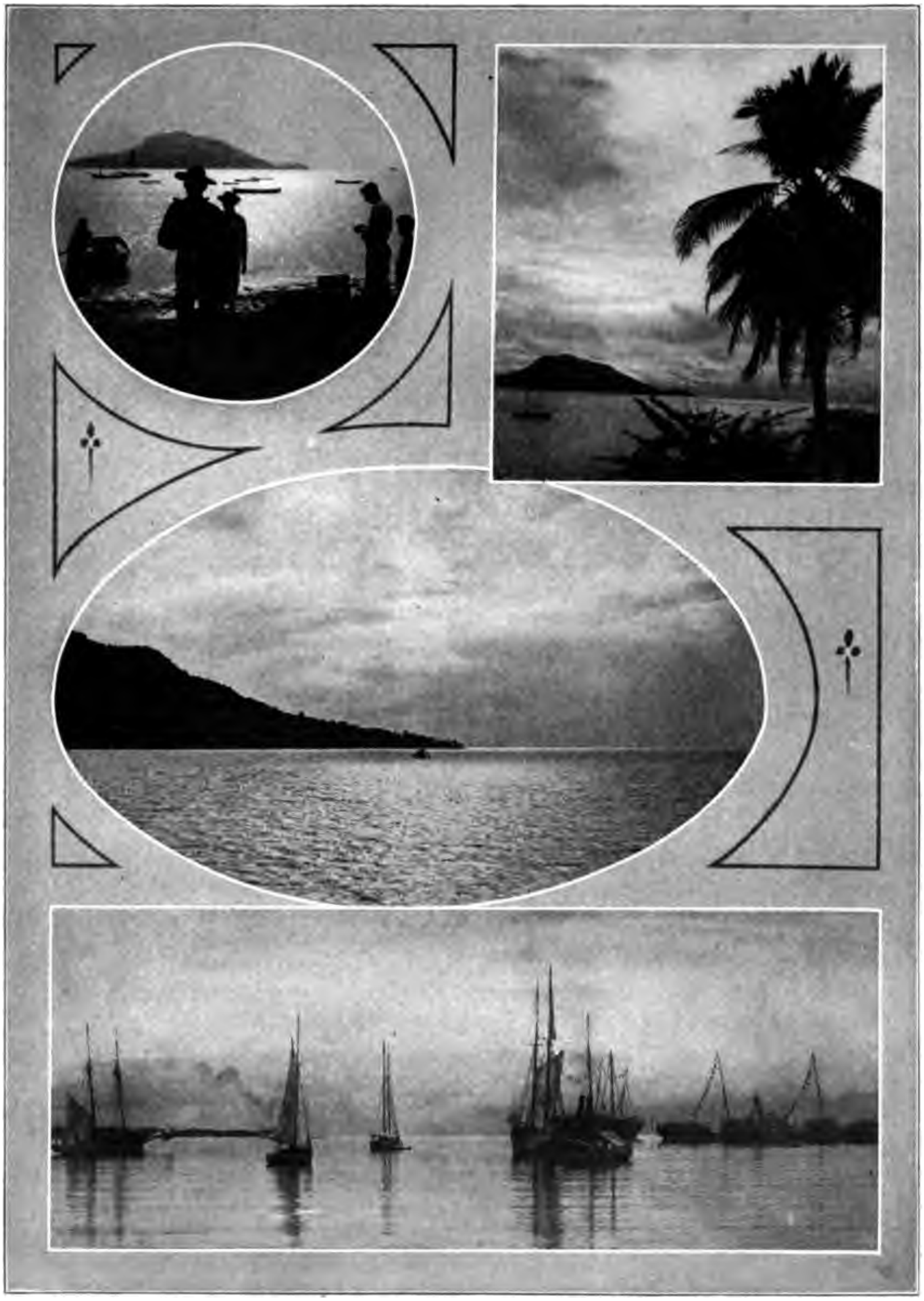
THE eighth wonder of the world, the crowning achievement of man's greatest undertaking, is the construction of the Panama Canal by the Government of the United States and, since this stupendous work has been accomplished in much shorter time than was thought possible, there are necessarily many reasons for congratulations for the skill and perseverance displayed aside from the fact that in completing this enterprise our government has at the same time succeeded in changing the commercial highways of the world.

Doubtless for centuries to come the world-wonders of the Panama Canal will be told in story and in picture, but the eloquence of the theme itself will never be exhausted while reverence for mighty deeds finds lodgment in the hearts of men.

Recognizing as much as one man could the magnitude and importance of the work being performed on the Isthmus, the Author for almost two years dwelt among the activities of this gigantic enterprise, and in these pages authentically presents to the reader his chronicles of the step-by-step progress of the construction from beginning to completion, as well as the successful installation of the world's majestic waterway from ocean to ocean.

Clothed as it is in a beauty of typography and art illustrations in keeping with the grandeur of the subject he feels assured of a cordial reception on the part of the public of the result of his efforts.

THE AUTHOR.



SUNRISE, SUNSET AND MOONLIGHT SCENES ON PANAMA BAY.

During February and March the moon is particularly bright, due to the clear atmosphere which prevails in the height of the dry season. On certain brilliant evenings it is possible to read in the moonlight. The cloud effects are perfect and the rainbows magnificent. One of the prettiest effects, which happens but rarely, is a rainbow at night.

DISCOVERY AND SETTLEMENT

THE history of the Panama Canal begins with the search for a western waterway to the Indies, and for fame and gold, by those hardy adventurers who followed in the wake of Columbus. These men, fresh from the Moorish wars, and equipped for a struggle with Italy which did not come to pass, looked for new fields to conquer. Nothing suited them better than the discovery of a New World peopled by heathens waiting to be converted by the sword to the Christian faith, after their gold, of which they seemed to have plenty, was stripped from them to fill the empty coffers of Spain.

This search by the followers of Columbus was fairly successful, so far as fame and gold were concerned and, although no direct water route was found to the Indies to the west, it naturally led to the settlement of the Isthmus of Panama, the narrow strip of land separating the two great oceans and forming the connecting link between North and South America. The establishment of settlements on both coasts and the short distance between them, led to the building of crude roads and trails for the early mule trains. These trails led to the construction of a railroad, and the railroad to a ship canal, for trade follows settlers, and water is the natural highway between nations. The story of the Isthmus is, therefore, in a measure, the evolution of transportation routes.

EARLY DISCOVERERS

The first European to sail along the coast of Panama was Rodrigo de Bastidas, who sailed from Cadiz in October, 1500, and first touched the continent near the island of Trinidad, and from there went west as far as Nombre de Dios. With him on that voyage was Vasco Nuñez de Balboa, who, later, was to discover the great South Sea, and Juan de la Cosa, who had sailed with Columbus on his second voyage and was considered one of the most able mariners of his day.

Columbus sailed from Cadiz on his fourth and last voyage in search of a passageway to the Indies in May, 1502. On this voyage he skirted the shores of Honduras and Costa Rica, to Almirante Bay and Chiriqui Lagoon on the coast of Panama. At the latter place he was told by the Indians that, if he would continue his course to the east, he would soon come to a narrow place between the two seas, and this led him to believe that his search for a strait was nearing success; that he would soon pass into the Indian Ocean and thence around the Cape of Good Hope to Spain, surpassing the achievement of Vasco de Gama, the Portuguese, who had already sailed around Africa (1497-1498) in his search for a water route to the Indies. Columbus continued on his way and passed the site of the present city of Colon at the Atlantic entrance to the Canal, and on November 2, 1502, arrived at a harbor 18 miles northeast, which he named Porto Bello, signifying beautiful port. He stayed there a week stormbound, and then continued on past Nombre de Dios, thus overlapping the voyage of Bastidas. He gave up his unsuccessful search for a strait eventually, and took to the more practical work of hunting for gold. His attempt to found a colony at the mouth of the Rio Belen, southwest of Colon, failed, and on May 1, 1503, he sailed from the shores of the Isthmus. He died on May 20, 1506, still believing that he had discovered the eastern shores of Asia. This belief was shared by all the early voyagers until the discovery of the Pacific Ocean in 1513.

Statue of Columbus and Indian Girl. Presented to General Mosquera of Colombia in 1868, by the Empress Eugenie, and afterwards turned over to Count DeLesseps. Now occupies a commanding position on Cristobal Point.

THE FIRST SETTLEMENT

After the unsuccessful attempt of Columbus to found a settlement in Castilla del Oro (Golden Castile), as the Isthmus was termed, two colonizers were sent out by King Ferdinand. One of these, Diego de Nicuesa, a Spanish nobleman, more fitted for the court than for a command in the wilderness, was given control of all the land between Cape Gracias á Dios, Nicaragua, and the Gulf of Urabá, or Darien, the eastern limit of the present Republic of Panama. The other was Alonso de Ojeda, who accompanied Columbus on his second voyage, and in addition had made two trips to the continent independently. Ojeda was placed in charge of the land east and south of the Gulf of Urabá called Nueva Andalucia. Both of these expeditions outfitted and sailed from Santo Domingo in November, 1509.

Associated with Ojeda were Juan de la Cosa, as lieutenant in the future government, and a lawyer named Bachelleer Enciso, who furnished most of the money to equip the expedition. It was arranged that Enciso should remain at Santo Domingo to collect recruits and supplies, procure another ship, and join Ojeda later at the proposed colony.

Ojeda landed near the present city of Cartagena, Colombia, founded in 1531. Here he attacked and overcame the Indians with a part of his force, but in following up his victory, his men became scattered, and all those who had landed were killed, with the exception of himself and one other. Among the killed was the veteran Juan de la Cosa. Ojeda then entered the Gulf of Urabá and founded the town of San Sebastian on the eastern shore, but was soon compelled to return to Santo Domingo to obtain men and supplies. He left the new colony in charge of his lieutenant, Francisco Pizarro, famous in history as the conqueror and despoiler of Peru, with the understanding that if he did not return within 50 days the colonists should decide among themselves the best course to follow. He finally reached Santo Domingo, after suffering shipwreck and many hardships on the island of Cuba, and found that Enciso had departed long before with abundant supplies for the colony, but he was unable to recruit another force to follow.

Pizarro and his men, suffering for lack of food, waited anxiously and in vain for the return of Ojeda, and then abandoned the colony and sailed for Cartàgena. Here they found Enciso with reinforcements and provisions. With Enciso was a stowaway in the person of Vasco Nuñez de Balboa. Enciso insisted on Pizarro and his men returning with him to San Sebastian. On their arrival, they found the settlement destroyed by Indians. They were without food, and at the suggestion of Balboa, who had sailed along these shores with Bastidas, they crossed the Gulf of Urabá, where it was reported the Indians were less warlike and provisions could be obtained. It was necessary, however, for them to defeat a band of Indians under a powerful chief named Cemaco, who disputed their landing, but they obtained the much needed supplies, and founded the settlement of Santa Maria de la Antigua, the first on the Isthmus. They were now in the territory which had been assigned by the King to Nicuesa and, consequently, had no right there. The ambitious Balboa took advantage

Columbus Island where Christopher Columbus stopped to repair and scrape the bottom of his ships before proceeding on to Spain.

of this circumstance and the fact that Enciso was disliked by his men, for the reason that he allowed no private trading with the Indians, to depose him, and asked Nicuesa to come and take charge of the colony.

November 2, 1502, Columbus arrived at this harbor, 18 miles northeast of Colon, which he named Porto Bello, signifying beautiful port. Rock for the concrete used in the locks at Gatun was obtained at this point.

Nicuesa had already sailed from Santo Domingo, taking along with him about 700 colonists. During the voyage, a terrific storm arose, wrecking some of his ships and causing the loss of 400 lives. In the tempest the ships became separated; some of them reached the coast at the mouth of the Belen River, and others the mouth of the Chagres River. After collecting his men, Nicuesa left the Belen River, and after doubling Manzanillo Point shortly landed, saying: "We will remain here in the name of God." This was the site of the town of Nombre de Dios, the oldest existing settlement on the Isthmus. During American canal times, the sand for the concrete in Gatun Locks was obtained here, and in 1910 and 1911, the sand dredge cut through the hulks of two old ships, believed to be relics of the days of Nicuesa. The dredge pumps also drew up bullets and other small articles.

Nicuesa's situation was desperate, as he was without arms or provisions, but fortunately there arrived shortly his lieutenant Colmenares, who brought supplies, as well as information concerning the new settlement at Antigua. Nicuesa declared his intention of going there and taking all the gold found by Ojeda's men as rightfully belonging to him. News of his intention reached Antigua before he did and, on his arrival, he was met by an armed mob, secretly urged on by Balboa, which cast him adrift in a leaky brigantine along with 17 followers who had remained faithful to him. They were never heard of again. Of the two expeditions, one was now left at Antigua, and of the two men sent by the King of Spain to colonize the mainland, both were gone. Balboa the stowaway ruled in Darien, March 1, 1511.

DISCOVERY OF THE SOUTH SEA

The first move Balboa made on finding himself in charge of the colony was to secure his position by persuading Enciso and those who had led the mob in the attack on Nicuesa to return to Spain. Knowing that they would immediately go to the King and ask that he be dispossessed, he started in to obtain the gold which he knew the King thought more of than all else, and to make new discoveries which would help his cause. The gold he obtained from the Indian chiefs of the Darien. It was made the price of peace, and Balboa showed his shrewdness by making allies of the Indians after he had obtained their treasure. Such an alliance he made with Careta, the cacique of Coyba, who after his village had been sacked by the Spaniards, left with Balboa one of his daughters as a hostage. Balboa accepted the Indian maiden, of whom he became very fond and, although they were never married according to the Christian rites, she considered herself his wife.

Balboa started from Antigua on September 6, 1513, to cross the Isthmus and find the great sea to the south, of which the Indians, knowing the cupidity of the Spaniards, had told him glowing tales of the riches of the great race of people which inhabited its shores. Fighting the different tribes which he met on the way, subduing and making friends with them, on September 25, he reached a hill in Darien from which it was said the South Sea could be seen. Halting his men, Balboa made the ascent alone, and was the first European to gaze upon this heretofore unknown ocean. Six days later, September 29, 1513, four hundred years ago, he waded into the ocean and took possession in the name of the sovereigns of Spain. This was in the Gulf of San Miguel, so named for the reason that it was discovered on St. Michael's Day. He also performed a similar ceremony when he reached a point of land at the entrance to the gulf. Balboa subdued the local Indian chiefs, who gave him presents of gold and also many pearls from the Pearl Islands a few miles off the shore, and confirmed the rumors of a powerful and rich nation to the south. The Pearl Islands, so

A family of Indians, Darien.

named by Balboa, could be plainly seen, but he did not visit them at that time on account of the roughness of the sea and the frailty of the available Indian canoes. He named the largest of the islands, Isla Rica, which is now known as San Miguel, or Rey Island.

Nombre de Dios, the oldest existing settlement on the Isthmus. Sand was obtained here for the cement usea in the Gatun Locks.

Balboa returned triumphant to Antigua after an absence of about four months. His messenger telling of his great discovery did not reach the King, unfortunately, until after that monarch, listening to Enciso's complaints, had sent out a new governor to take charge of the colony.

BALBOA'S UNFORTUNATE END

The new governor was named Pedro Arias de Avila, commonly called "Pedrarias the Cruel," which nickname he won in the New World by his method of extorting gold from the Indians. With Pedrarias was Hernando de Soto, who was later to discover the Mississippi River, and Diego de Almagro, who was to become the partner of Pizarro in the conquest of Peru. Unlike Balboa, Pedrarias did not try to make friends with the Indians, but in many instances repaid the hospitality which they extended to him as a friend of Balboa with the utmost treachery, destroying their villages, killing women and children, and selling those who survived into slavery. He undid what Balboa had been in a fair way of accomplishing, that is, the settlement of Darien, for the Indians were everywhere aroused and repaid cruelty with cruelty as often as an opportunity was presented.

Pedrarias strove to establish a line of posts for communication between the two oceans in accordance with the ideas of Balboa, but without success. The first of these was located on the Atlantic coast at a place named Santa Cruz.

Shrines are common along the waysides and at the entrance to villages, but this one has been placed in a hollow tree. The photographer discovered it near Gorgona.

In the meantime, the King had recognized Balboa's discovery with a commission as Adelantado of the South Seas and Viceroy of the Pacific coast, an empty title, as he was subject to the orders of Pedrarias. Pedrarias, jealous of Balboa's achievement, held up this commission and kept Balboa fighting for his liberty in the court of Antigua on trumped up charges. Finally Balboa made an alliance with Pedrarias by promising to marry one of his daughters, who was at that time in Spain, and went a few miles up the coast to a place called Acla, between Antigua and Santa Cruz, where he established a settlement and had timbers cut and shaped which could be readily built into ships with which to explore the new sea which he had discovered. These timbers were carried across the Isthmus by Indian slaves and were set up in San Miguel Bay.

While at the Pearl Islands, from where he made several short cruises, Balboa heard of the coming of a new governor to supersede Pedrarias. Thinking this governor might be hostile to his plans, he sent messengers to Antigua to see whether or not he had arrived. If he had, he instructed the messengers to return without allowing their presence to become known, and he would then leave on his voyage of discovery before orders for his recall could be delivered. His messengers went to Antigua and found Pedrarias still in charge, for the new governor had died on his arrival. One of them, however, told Pedrarias that Balboa was contemplating treachery and the founding of an independent colony on the Pacific coast. The bitterness and jealousy

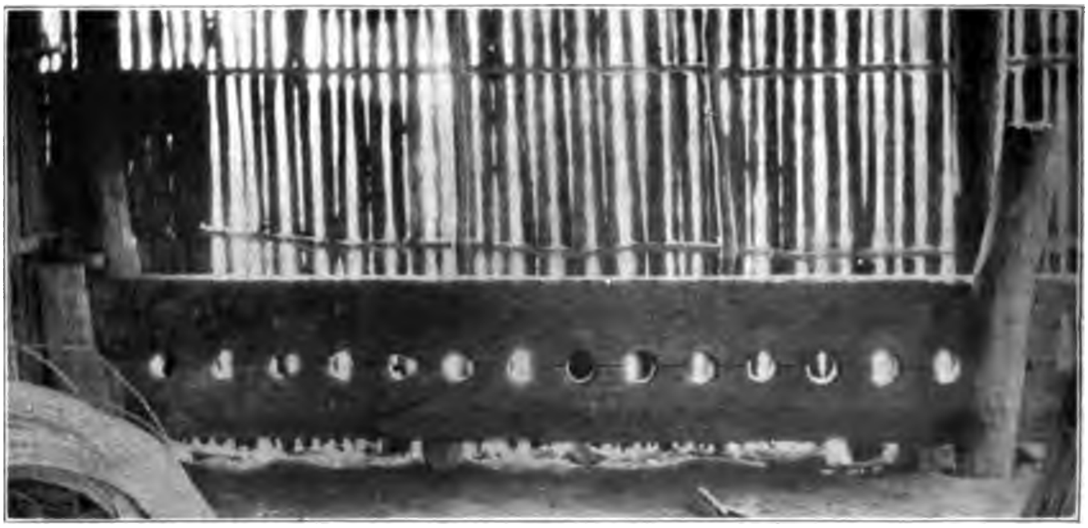
A wayside cross, or shrine. Some of these are very old.

Village of San Miguel on Rey Island, one of the larger of the Pearl Island Group.

of Pedrarias for Balboa again came to life, and he sent Francisco Pizarro, who was later to finish the work Balboa had planned to do, to bring him back to Acla. At Acla, Balboa was given a mockery of a trial for treason, and was beheaded with four companions in the latter part of 1517. Second only to the discovery of the South Sea was the demonstration of the practicability of an Isthmian transit.

SETTLEMENT OF OLD PANAMA

Pedrarias seeing the advantage of a settlement on the new ocean as an outfitting station for future exploring expeditions, crossed the Isthmus and, on August 15, 1519, founded Panama, situated about five miles east from the new city. The name "Panama" is supposed to have come from an Indian word meaning a place abounding in fish, and tradition relates that the town was built on the site of an Indian fishing village. In the same year the Atlantic port was transferred to Nombre de Dios, directly north of old Panama, and a few years later Antigua and Acla were abandoned to the Indians.



Some of the interior villages have no jails stout enough to hold a prisoner, so the stocks are resorted to

On September 15, 1521, the settlement at Panama was made a city by royal decree, and the first bishopric in the Americas was removed there from Antigua. The new governor sent out, opportunely for Pedrarias, died on his arrival, as did several others who followed, and Pedrarias ruled until the arrival of Pedros de los Rios, who took charge on July 30, 1526. Before his arrival, Pedrarias took refuge in Nicaragua where he had already established a settlement.

SPAIN'S POWER SPREADS

Following this period in Isthmian history many parties set out inland to explore the country, and outposts were located in the provinces of Chiriqui and Veraguas. These explorations were made in accordance with the desires of Charles V, who took a great interest in the exploration of the South Sea and the discovery of a strait connecting it with the Atlantic Ocean. After he came to the throne of Spain in 1516, he charged the governors of his American colonies to examine the coast line from Darien to Mexico for a possible waterway.

In accordance with this policy, Gil Gonzales de Avila was sent out from

Spain in 1521, with instructions to make a search along the coast for the western opening of a strait. Gonzales dismantled and transported his ships across the Isthmus and rebuilt them on the Pacific side. In January, 1522, he sailed from Panama bay and went as far as the Bay of Fonseca, where he landed and discovered Lake Nicaragua. On this voyage Gonzales met men sent out on similar service by Cortez, who, later, established a transit route across the Isthmus of Tehuantepec in Mexico, following pretty closely the present railroad. This route was started in much the same manner as the one across Darien, through the necessity of transporting suitable lumber from the Atlantic coast of the Isthmus to build ships with which to explore the Pacific coast. When Pedrarias learned of the discovery of Lake Nicaragua, he immediately laid claim to it, and as the country was rich in gold, established a city at Granada near the shores of the lake after subduing the Indians. In 1529, Captain Diego Machuca thoroughly explored the lake and discovered its eastern outlet, the San Juan River. Sailing down this stream he finally reached the Atlantic Ocean, and sailed along the coast until he arrived at Nombre de Dios, thus opening up another route across the American Isthmus.

Old Fort at Porto Bello.

The first extensive explorations to the south were the voyages of Pizarro and Almagro in 1524, which ended in the conquest of Peru. In 1527, an expedition sailed up the Rio Grande, carried their canoes across the divide at Culebra to a tributary of the Chagres, down which they sailed to its mouth, thus going over the present Canal route.

PERIOD OF THE GREAT TRADE

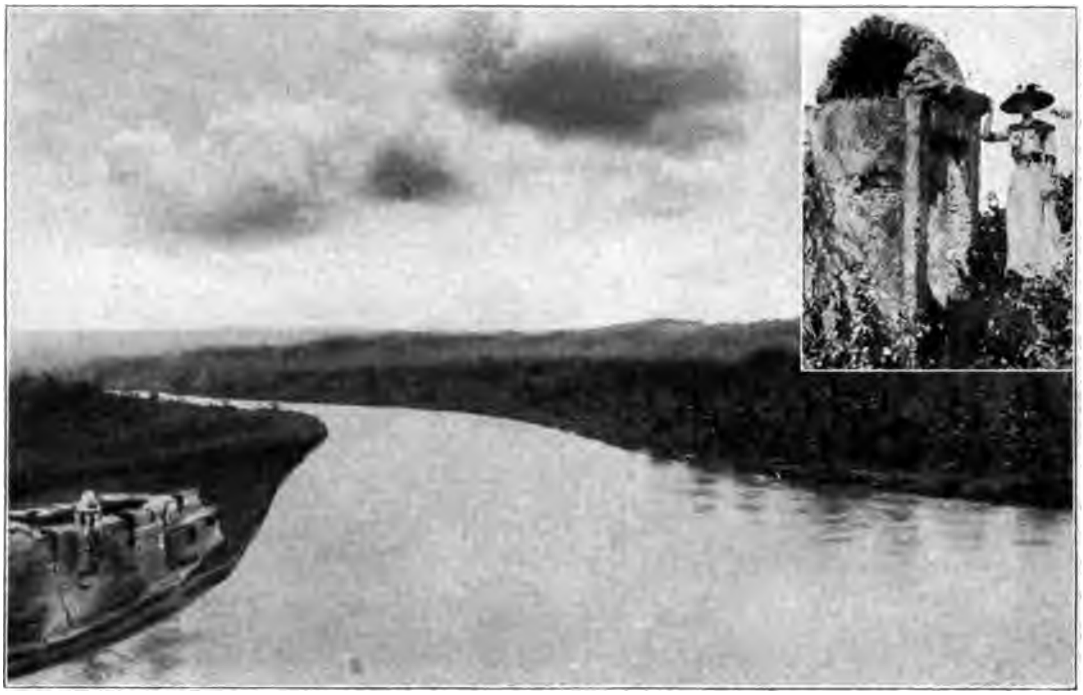
Permanent settlements were now located at Nombre de Dios and at Panama, and between these two points was established a paved trail or "royal highway," for the commerce across the Isthmus at that time was steadily on the increase, making Panama a place of mercantile importance. In 1534, a route by water for boats and light draft vessels was established from Nombre de Dios along the coast and up the Chagres River to the head of navigation at Cruces. From Cruces there was another trail to the city of Panama. Over these trails pack trains carried on the trade, the river being used in the wet seasons, and when the attacks of the Indians and Cimaroons, (negro slaves, who rebelled and were outlawed), became too frequent on the overland trail. This trade consisted of gold and ornaments stripped from the temples of the Incas, gold from the mines of Darien and Veraguas on the Isthmus, silver from Bolivia, pearls, and also wool, indigo, mahogany, dye woods, cocoa, and tobacco, all bound for Spain, for which the colonists received clothing and foodstuffs in return. For nearly two hundred years the trails from Panama to the towns of Nombre de Dios and Porto Bello were the richest trade routes in the world. Some of this trade even originated across the Pacific in the Philippines and the Indies. Later, after the period of the great trade, 1550-1750, and up to the time of the Panama railroad, the part water and part overland trail from the mouth of the Chagres to Cruces, 34 miles, and thence to Panama, 18 miles, was used by the colonists when California and Oregon were opened to settlement, and by the gold seekers in California in the days of '49.

The three ancient bells of Cruces. This town was one of the oldest on the Isthmus, and was the head of navigation on the Rio Chagres before the days of the railroad. Abandoned in 1913 on account of its being in the lake area.

After Nombre de Dios was destroyed in 1597 by Sir Francis Drake, the royal port was changed to Porto Bello, 17 miles to the southwest. This change was beneficial, as Nombre de Dios was always unhealthful, while Porto Bello had a better harbor and was nearer to the mouth of the Chagres and Panama.

Porto Bello became one of the strongest fortified of the Spanish settlements in the New World. Here, came the Spanish galleons once a year to collect the King's treasure, and to bring supplies for the colonists, and here, each year, on the arrival of the ships, the merchants would congregate to take part in a big fair which was held during the annual visit of the fleet.

The town is situated on a bay about a mile and a half long by 2,500 feet wide, and the ruins of five of the six forts which guarded it, as well as an old custom house, can still be seen, although partly covered with jungle growth. One of the six forts was on the side of the hill on the opposite side of the bay from the old town and where the Isthmian Canal Commission has been quarrying rock for the past four years for Canal work, and it was dug away by steam-shovels. After Porto Bello became the royal port on the Atlantic, the Chagres River and the Cruces trail came into general use as a highway, although there was also an overland road, and to protect this route from pirates who were becoming bold enough to attack fortified towns, Fort San Lorenzo was built in 1601 at the river mouth.



Mouth of the Chagres River. The old fort on the left and one of the turrets on the right.

THE SCOTCH BUBBLE

England lost its opportunity in 1698-1700 to gain a foothold in the Isthmian trade by failing to lend its aid to the colonization scheme of William Patterson, a Scotch financier, who had already founded the Bank of England. Patterson's plan, which eventually cost about 2,000 lives and $100,000 in money, was designed to break up the monopoly of the British East India Company in the Oriental trade by founding a colony on the shores of Darien, and opening up a free trade route across the Isthmus from Acla to the Gulf of San Miguel, over the same route taken by Balboa nearly 200 years before. Permission for the formation of the company with this end in view was obtained from King William. His approval, however, was later withdrawn at the instigation of the East India Company, when it realized that its monopoly was in jeopardy, and instructions were issued to the governors of the British colonies in the West Indies and North America to withhold any aid to the Scots who had already departed for Darien. The opposition of the East India Company forced the new project to return all the money subscribed for stock in England, and to raise the necessary funds in Scotland only.

On November 1, 1698, three ships and two tenders containing 1,200 men reached the Darien from Leith, and founded the town of New Edinburgh on the Gulf of Calidonia, near Acla. Here they were welcomed by the San Blas Indians who saw in them future allies against the Spaniards. But the Scots had no intention of fighting, much to the disappointment of the Indians, although they must have known that their invasion would be resisted by the Spaniards. The first expedition managed to stay eight months, during which time their numbers were sadly reduced by sickness and famine. On June 20, 1699, two hundred and fifty survivors, with Patterson who had gone out to the colony as a volunteer, and whose wife and son had died there, left for New York, which place they reached on August 13. Meanwhile, the company at home, not knowing of the abandonment of the colony, sent out a second band of 300 recruits. This party arrived at New Edinburgh on August 13, the same day that their predecessors reached New York. Finding the half-completed Fort St. Andrew deserted, they immediately left for Jamaica with the exception of a few men who insisted upon remaining. A third expedition consisting of four ships and 1,300 men was sent out from Scotland, and reached New Edinburgh on November 30, although rumors of the failure of the first attempt had been received.

At last the Spaniards determined to oust the invaders who, unable to accomplish much on account of internal bickerings, the opposition of England, and a high death rate, sent out a fleet of ships from Cartagena on February 25, 1700, to invest the port by sea, while a land force blockaded it in the rear. On March 31, after many sorties against the Spanish forces, the colonists surrendered and were allowed to depart with honors. The colony had been reduced to about 360 persons, and these were so sick and feeble that it is said the Spaniards had to help them aboard their ships and set the sails for them.

"A Nation given to the world,
 A giant's task begun,
Show what our Uncle Sam can do
 In an orbit of the sun.
O great indeed is our Uncle Sam
 And his greatness ne'er shall cease!
For greatest of all his conquests won,
 Are his victories of peace!"

—*Gilbert.*

RAIDS OF THE BUCCANEERS

SPAIN monopolized the early trade with its colonies and this policy eventually lost its control of the countries of Central and South America. The first direct result was the entering of English, French and Dutch free traders and later, buccaneers and pirates, all of whom ranged up and down the coast of the Spanish Main preying upon commerce and even attacking the fortified towns.

Up to the time Sir Henry Morgan became Governor of Jamaica, after the sack of Panama in 1671, there was very little difference between free traders, privateers, buccaneers and pirates, their object being the same,—the easy acquisition of gold and other loot by preying upon the commerce of Spain. From 1550 to 1750, the Isthmian trade route was open to such attacks. After the sack of Panama, however, England endeavored to put a stop to piracy in the West Indies (Jamaica was the outfitting station for many ships sailing under commissions granted by the governor who received a share in the spoils), and after that time the pirates were hunted as a common enemy, and they in turn preyed upon the shipping of all nations.

The result of the depredations of these freebooters finally forced Spanish shipping to give the waters of the Indies a wide berth, and to take the longer route through the Straits of Magellan to the colonies on the Pacific, although this trade was already beginning to decline, partly through the failure of the colonies to develop after the easily won treasures of the Incas began to give out, and partly through the decadence of Spain as a sea power.

The free traders, who finally developed into pirates, were generally welcomed by the colonists, unofficially, as Spain was not a manufacturing country and was unable to supply their needs, and because it was greatly to their benefit to obtain goods of a better quality upon which no taxes had been paid to the King. The traders were forbidden entry into the ports, and were compelled to smuggle their goods in at convenient points along the coast and in secret harbors. The custom of treating these men as pirates when caught, naturally led them to protect themselves and, when the opportunity offered, to retaliate in kind, and they finally became buccaneers or pirates in name as well as in fact. The name buccaneer was given to the free traders by the *boucaniers*, men engaged in supplying them with smoke-cured meat for their voyages.

DRAKE'S EXPEDITION

The first Englishman to make his name feared by the Spanish in the West Indies was Sir Francis Drake. In 1568, Sir John Hawkins, with an English fleet, entered the harbor of Vera Cruz, Mexico, to trade with the Spaniards. He was received by the officials of the port in a friendly manner and invited to anchor. As soon as his ships were anchored under the guns of the forts, he was attacked and all his ships destroyed, with the exception of two which managed to escape, one belonging to himself and the other to his cousin Francis Drake.

Sir Henry Morgan.

Drake returned to England and endeavored to obtain satisfaction for his losses through his government, but was unable to do so. He then decided to collect his own indemnity by attacking Spanish shipping as he had been attacked. He obtained Letters of Marque from Queen Elizabeth, and, in 1571-1572, made two preliminary voyages to the West Indies, principally to prepare for future raids and to learn how the Spaniards handled the golden harvest from Peru. In 1572, he returned with two ships, in the holds of which were stored the parts of three small sailing boats, and on July 29, having put the boats together, he attacked and captured Nombre de Dios where the King's treasure house was at that time located. He would have made a rich haul of the gold waiting for the arrival of the fleet from Spain had he not been wounded in the assault on the town.

Drake then made his headquarters on the coast, and made many forays on shipping, even taking ships from under the guns of Cartagena. With the help of the Indians, who since the days of Pedrarias were always ready to help the enemies of Spain, and of the Cimaroons (as escaped negro slaves who had banded together in the jungle and waged continual war on the Spanish pack trains were called), he crossed the Isthmus to the Pacific, in time to see a Peruvian plate fleet riding at anchor in the bay of Panama. He planned to ambush the pack train carrying the treasure from this fleet near Venta Cruz, or Cruces, but failed to obtain any gold, the Spaniards aware of his presence, sending a train of mules bearing provisions in advance. He captured and sacked Cruces but, as this was merely a stopping place for the pack trains, he procured very little booty. Another ambush outside of Nombre de Dios was more successful, his men taking away all the gold they could carry and burying several tons of silver in the vicinity. In 1573, he returned to England and started to organize a fleet to go to the Pacific, but John Oxenham who had been with him when he crossed the Isthmus, forestalled him in his desire to be the first Englishman to sail upon those waters.

John Oxenham crossed the Isthmus in 1575, with the help of the Indians, over the same route traversed by Balboa, and launched a small boat on the Pacific. He stayed in the vicinity of the Pearl Islands taking several small Spanish prizes, and finally captured one of the treasure galleons from Peru. Oxenham and his crew were finally captured by the Spaniards and put to death.

Drake returned to the West Indies on November 15, 1577, sailed through the Straits of Magellan, swept the west coast of South America as far north as California, without attacking the city of Panama, crossed the Pacific, passed around the Cape of Good Hope and landed in England in 1580, having gone completely around the world. In 1595, he again returned to the Isthmus, and, with Sir John Hawkins, captured and burned Nombre de Dios, and started across the Isthmus to attack the city of Panama, but the Spaniards had barricaded the royal road so effectively that the English gave up the attempt. They went to Porto Bello instead, and just previous to the attack on that place, January 28, 1596, Drake died and was buried at the mouth of the bay.

Drake's example was followed by William Parker, who attacked and sacked Porto Bello in 1602. From the time of Drake, Porto Bello had little rest from attack; its forts were rebuilt only to be again destroyed.

FALL OF OLD PANAMA

Henry Morgan was one of the first of the pirates to attack the mainland. In June, 1668, he plundered Porto Bello, and at that time sent a message to

Section of wall and Spanish cannon, with embrasure, in old fort at Porto Bello.

the Governor of Panama that he would return in a short time to take that city. As he promised, he returned to the Isthmus two years later, sent an advance force, which attacked and captured Fort San Lorenzo at the mouth of the Chagres, placed a garrison there and at Porto Bello, and started up the Chagres and overland with 1,200 men, the Spaniards retreating before him. It took the Englishmen nine days to make the journey, and they suffered greatly for want of food as the Spaniards in their retreat on Panama laid waste to the country. Panama was captured on January 28, 1671. Before the city fell fire broke out and the place was entirely ruined. Morgan was accused of having set fire to the town, but it was more likely that it was caused by a spark blown into an open powder magazine, which had been ordered destroyed by the Governor, Don Juan Perez de Guzman. However, Morgan stayed in the ruins nearly a month, collecting booty, and also plundered the neighboring islands and the surrounding country. He then returned to San Lorenzo, and sailed to Jamaica with the largest share of the booty, leaving his companions to leave the Isthmus as best they could. The attack on Panama was made when England was at peace with Spain, and the British Government was forced to suppress buccaneering in Jamaica on account of the storm of protest aroused. Morgan was made Lieutenant-Governor of Jamaica, was later knighted and became governor of the island, in which capacity he did good work in suppressing piracy. His appointment would appear to have been made by the King on the theory that it takes a thief to catch a thief.

OTHER ATTEMPTS

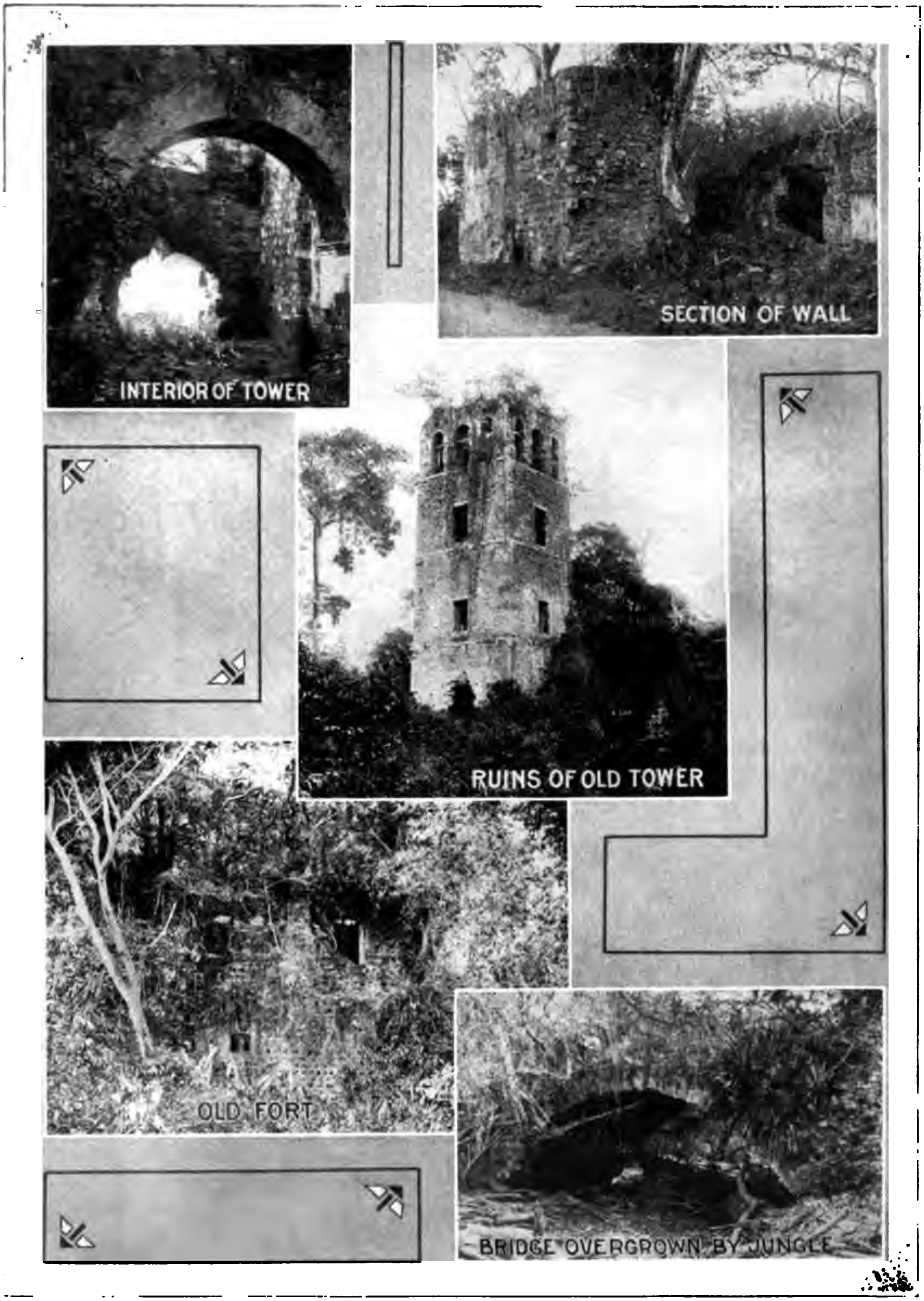
Although Drake and Morgan were no longer feared, the Isthmus was not yet free from the raids of numerous other pirates, French and English, who

Wall of the old fort at Porto Bello, showing entrance, and watch tower.

attacked Porto Bello, crossed the Isthmus, and raided up and down the coast of the Pacific. Captain John Coxon plundered Porto Bello in 1679, and in the following year crossed the Isthmus to the Pacific in company with Captain Richard Sawkins, Bartholomew Sharp, Peter Harris and Edmund Cook, accompanied by over 300 men. They crossed the Isthmus of Darien, guided by the Indians, in April, 1680, and attacked Santa Maria, an outpost on the Tuyra River. Not finding the expected gold at Santa Maria, they voyaged in canoes and in two barks, captured by Captains Sharp and Cook, to Panama. Arriving off Panama, they were attacked by three Spanish ships near the island of Perico. In the fight which ensued on April 23, 1680, the English were victorious, but they failed to attack the city owing to a disagreement between themselves as to who should be leader, although they stayed in the vicinity many days picking up prizes. Captain Sawkins was killed later in an attack on the mining town of Pueblo Nuevo, in the Province of Veraguas. Captain Coxon had already left with his men to recross the Isthmus to the boats left on the Atlantic, and Captain Harris died from wounds received in the battle of Perico, leaving Captains Sharp and Cook to continue their voyages in the South Sea. Captain Sharp returned to England where he was tried for piracy, but escaped hanging on account of lack of evidence. From 1680 to 1688, pirate raids wiped out every settlement on the Pacific coast of Darien. In 1688, England became the ally of Spain, and the pirates ceased operations for the time being.

Scene in the village of Chagres at the mouth of the river of that name.

War broke out between England and Spain in 1738, and in 1739 Porto Bello was again captured and destroyed by Admiral Edward Vernon of the British Navy. In 1740, Vernon captured Fort San Lorenzo, and in 1742, he again took Porto Bello and prepared an assault on the new city of Panama against which a fleet was going around the Horn under command of Captain Anson. However, Vernon's men began to fall sick, so he gave up the attempt



The tower is the most important remaining evidence of the greatness of the first city of Panama, destroyed by Morgan in 1671. It is located about six miles southeast of Panama City. The wealth of Peru was transported over the old masonry bridges centuries ago.

on Panama and went to Cartagena instead, at which place he met with a decisive defeat. Anson learning of this event, left to attack Manila and the new city of Panama was again saved.

The last of the Spanish galleons from Peru during the latter part of 1739

Pile of cannonballs at Fort San Lorenzo, used by the early Spaniards in resisting the attacks of the buccaneers.

found upon its arrival at Panama that Porto Bello was being attacked by Admiral Vernon, so it returned to Guayaquil and sent its treasure to Cartagena over the trail from Quito to Bogota. Thus the commerce of the Spanish galleons across the Isthmus ceased, and the gradual decay of the towns on the Isthmus wherein lived the merchants and traders set in.

"From sacked Porto Bello redhanded they came,
All bloodstained from conquest unworthy the name,
To the mouth of the Chagres, where, high on the hill,
San Lorenzo kept guard, to plunder and kill
Its devoted defenders, who courageously fought
For homes, wives and children, accounting as naught
Their lives held so precious, so cherished before,
Could they drive the fierce pirates away from their shore.
Three days they repulsed them, but to find every night
The foe still upon them in ne'er-ending fight.
Their arms could not conquer the powers of hell!
San Lorenzo surrendered—ingloriously fell!
Burned, famished and bleeding from many a wound,
They lay while their stronghold was razed to the ground."
—*Gilbert.*

PROPOSED CANAL ROUTES

THE project of connecting the Atlantic with the Pacific has attracted the attention of the civilized world since the discovery of the Isthmus. In the years 1534 to 1536, studies were made under the direction of the then governor of Panama, Pascual Andagoya, in compliance with a royal decree, dated February 20, 1534, for a ship canal across the Isthmus by cutting from the Chagres River to the headwaters of the Rio Grande, but the idea was abandoned on account of the excessive cost.

With a revival of interest in the subject, many routes were suggested and many surveys were made at different points where the width of the American Isthmus was found to be favorable, or where rivers and lakes were found that might be utilized as a possible passageway. Of the many routes proposed, it has been found that the one across Nicaragua, utilizing the San Juan River and Lake Nicaragua, and that at Panama along the line of the Panama railroad, utilizing the valley of the Chagres River and the Rio Grande, are the only practicable ones. Of the others, those which gained the most attention and which were given the most study were across the Isthmus of Tehuantepec, in Mexico, and three in Panama, the Darien, or Atrato River, the San Blas, and the Calidonia Bay routes.

TEHUANTEPEC

The Tehuantepec route, where the Spaniards under Cortez, after the conquest of Mexico, built a road across the Isthmus, is the best location, geographically, for a canal, it being so much closer to the Pacific and Gulf ports of the United States, while the distance from New York is practically the same as from Panama. However, the summit level at this point was found to be in the neighborhood of 700 feet and very broad, and it is doubtful if a sufficient supply of water could be obtained for it even if it could be materially lowered by excavation. When the French were at work on the Panama project, Captain James B. Eads selected this place for the location of a ship railway with large cars to transport ships from one ocean to the other. This never got beyond the "scheme" stage, although at that time it was considered practicable by engineers.

There is now an ordinary standard-gage railroad engaged at this point in carrying transcontinental freight.

ATRATO RIVER AND TRIBUTARIES

Various projects have been proposed to utilize the Atrato river, which flows almost directly north about 200 miles into the Gulf of Darien, at the point where the Isthmus joins the continent of South America, and several of its tributaries, which approach the Pacific coast very closely. There is an Indian legend that canoes can be carried for a short distance from the headwaters of the Atrato to another river flowing into the Pacific. The Atrato is a silt-bearing river and has a considerable fall, and is not in itself adapted to the use of ocean-going ships. It would necessitate continual dredging for a hundred miles to canalize it, and a cut through the continental divide much greater than the Cut at Culebra. The streams flowing into the Pacific are little more than mountain torrents. On this account this route has not been considered with as much favor as the more northerly ones. There is a widely circulated story that King Philip III, in the period 1616 to 1619, issued an edict at the request of Pere Acosta forbidding further consideration of the project on the ground that the will of God was made manifest by the fact that He had created an isthmus instead of a strait, and that it would be impiety for man to put asunder what God had joined. Probably a more reasonable objection was that a ship canal would make the Spanish colonies too easily accessible to their enemies. The policy of King Philip was adhered to for over 200 years after his death in 1698.

CALIDONIA

The Calidonia route is where Balboa crossed to the Pacific in 1513, and is the one which William Patterson chose in 1698 for a line of transit across the Isthmus to control the trade of the Pacific with the east. This route starts from Calidonia Bay on the Atlantic where Patterson's colony of New Edinburgh was located, to San Miguel Bay on the Pacific. At first this appears to be an ideal location for a ship canal on account of the short distance, 35 miles, between the two oceans. It was advocated by Dr. Edward Cullen of Dublin in 1850. He claimed that the summit level on this line was not over 150 feet. It was partly explored by Mr. Lionel Grisborne, an English engineer, in 1852, and he reaffirmed the claim of Dr. Cullen. Later explorations, among them those of Lieutenant Isaac G. Strain, U. S. N., in 1854, and by the United States Darien expedition in 1870, failed to confirm this low altitude. It was found that the summit level is at least 1,000 feet above the sea. Although the Isthmus is very narrow at this point, the excavation required is so great that it was proposed to build a tunnel 4.2 miles long through the mountains through which ships might pass. This project has long been considered impossible.

SAN BLAS

The San Blas route from the Gulf of San Blas to the Bayano River, which flows into the Pacific about 15 miles from the Pacific entrance of the present canal, is across the narrowest part of the Isthmus, the distance being about 30 miles from shore to shore. The distance from the Atlantic tidewater to tidewater in the Bayano River is about two-thirds of that distance. This route was explored under the direction of Mr. Frederick M. Kelley in 1857, and subsequently by an expedition under Commander Thomas Oliver Selfridge, Jr.,

U. S. N., in 1870. The difficulty here, as on the Calidonia route, lies in the height of the summit, to cross which tunnels from eight to ten miles long were also proposed.

The result of all these explorations and surveys resulted in the conviction that no other route compared in practicability with that of Panama and Nicaragua.

NICARAGUA

This route, utilizing Lake Nicaragua and the San Juan River, which flows out of it into the Atlantic, was used as an isthmian transit by the Spaniards as early as 1529. It became the subject of investigation as a possible Canal route in 1825, when the newly federated state of Central America advised the United States that it would encourage any such project by Americans. Several surveys were made, but no construction work was attempted. In 1850-1852 an American, O. W. Childs, organized a company under an agreement with Nicaragua, and established a transit route, partly by water and partly by stage road. This transit company also made surveys for a ship canal along this route. It forfeited its concession in 1858 without doing any work on the proposed canal. Later surveys were made by the United States under Commander E. P. Lull, and in 1889 canal construction was begun when the Maritime Canal Company of Nicaragua, composed of Americans, was formed under a concession from Nicaragua and Costa Rica. Financial difficulties, however, stopped the work and the company failed in 1893. For some years after efforts were made to induce the United States Government to finance the project, with the result that, in 1895, Congress provided for a board of engineers to ascertain the feasibility and cost of a canal at this point. This board, appointed by President Cleveland, consisted of Colonel William Ludlow, U. S. A., Civil Engineer M.

Swinging bridge, Chame.

T. Endicott, U. S. N., and Civil Engineer Alfred Noble. They reported that the Canal was feasible, but recommended further surveys and investigations. Accordingly a commission was appointed by President McKinley, which consisted of Rear Admiral J. G. Walker, Colonel Peter C. Hains, and Lewis M. Haupt. Before the work of this commission was completed Congress provided, in 1899, for increasing it for the purpose of making surveys, comparisons and a thorough examination of all possible routes from Tehuantepec to the Atrato River. The Commission, which became known as the Isthmian Canal Commission, was now reinforced by the appointment of Colonel O. H. Ernst, Alfred Noble, Geo. S. Morrison, and William H. Burr, engineers, and Professor Emory R. Johnson and Samuel Pasco as experts, respectively, on the commercial and political aspects of the problem. Explorations were made of the entire Isthmus, but no favorable route was found other than that at Nicaragua and that at Panama. The Commission reported on November 16, 1901, in favor of the construction of a canal across Nicaragua, provided the property of the New French Canal Company on the Isthmus of Panama could not be purchased for $40,000,000, nearly one-third of the price asked.

The total length of the canal proposed at Nicaragua was about 187 miles, 47 miles of which was in deep water in Lake Nicaragua, 17 miles in the river not requiring improvement, leaving 121 miles of river to be canalized. It was to have nine locks. The difficulties which would have to be overcome are about the same as at Panama. However, the longer distance at Nicaragua and the proximity to active volcanoes made it less desirable than the Panama route. The latter was more advantageous because of the Panama railroad and the extensive plant and work of the French.

PANAMA

The Panama Canal project, like the others, was the subject of many studies and surveys, the first, as stated above, being made in 1534. None of the surveys however were thorough prior to the one made by the Isthmian Canal Commission in 1890. Simon Bolivar, in 1827, caused a survey to be made of the route by an English surveyor, and in 1835 the United States sent Charles Biddle to investigate possible water or railroad routes across the Isthmus. He obtained a concession from New Granada (Colombia) for a railroad, but nothing further was done at that time. A few years later, 1838, a company of Frenchmen obtained a similar concession, and a report that a summit pass of 37 feet above sea level caused the French Government to send out Napoleon Garella to make a survey which corrected this error. He recommended a lock canal with a summit level of about 160 feet above sea level, a tunnel of 3½ miles through the divide, and 18 locks to make the required lift. It was not until May, 1876, that the Government of Colombia gave to the French Canal Company the concession under which the first canal work was done, although the Panama railroad was built in 1850-5, and other surveys had been made under the direction of the United States Government in 1854 and 1866. While the French were at work on the Canal many studies were made of the project by officers of the United States Navy.

The PANAMA RAILROAD

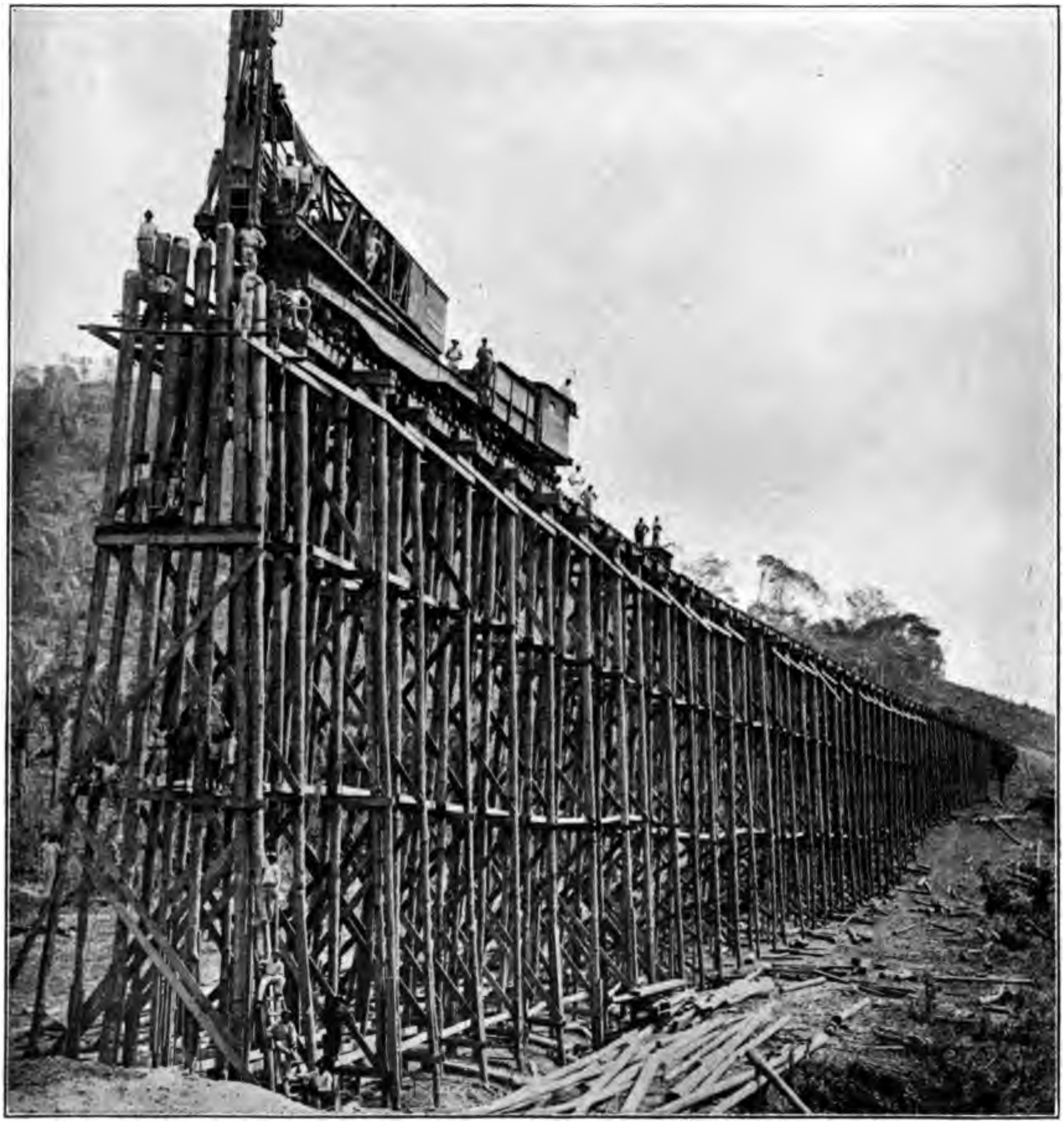
FROM 1750 to 1849, trade across the Isthmus was at a standstill, and the old pack trails from Porto Bello and from Cruces on the Chagres became nearly obliterated through disuse. Spain's belated change of policy, the granting of free trade to the colonies, came too late to be of much benefit to Panama. A few ships discharged their cargoes at the mouth of the Chagres for transportation over the Cruces trail, but there were no adequate facilities for handling any great amount of trade had there been any. What little trade there was went around Cape Horn or via the Cape of Good Hope. The Isthmus became a place of so little importance that it was reduced from a viceregency in 1718, when it became a province of New Granada (the old name for Colombia). It obtained its independence from Spain on September 26, 1821.

In 1849, however, the Isthmus again came to life with the steady flow of emigrants bound for California, where gold had been discovered during the previous year. California and Oregon had also been thrown open to settlement, and the Isthmian transit became almost a necessity, for the only other means of communication with those states were the long overland journey by wagon train across the American continent, and the long voyage around South America. Thus the Isthmus as a trade route again came to the front.

The advantages of an Isthmian railroad as a means of developing the trade of the United States with the growing republics of Central and South America was realized as early as 1835, when President Andrew Jackson appointed Mr. Charles Biddle as a commissioner to visit the different routes best adapted for interoceanic communication by rail or by water between the two oceans. Mr. Biddle visited the Isthmus, went to Bogota, and obtained from the Government of New Granada a concession for constructing a railroad across the American Isthmus. He returned to the United States in 1837 with this document, but died before he was able to prepare a report, so nothing further was done at that time. In 1847, a French syndicate, headed by Mateo Kline obtained a similar concession, but was unable to raise the money necessary to carry out the work. In December, 1848, three far-sighted Americans, William H. Aspinwall, Henry Chauncey, and John L. Stephens, entered into a contract with New

Granada to build the road, and the Panama Railroad Company, with a capitalization of $1,000,000, was incorporated under a charter granted in the state of New York. Aspinwall, in the same year, obtained from Congress a contract for carrying United States mail by steamer from Panama to California and Oregon, as a part of his railroad scheme. A similar mail contract authorized by Congress on the Atlantic side, New York and New Orleans to Chagres, was obtained at the same time by Mr. George Law.

As soon as the concession was obtained from New Granada, Mr. Stephens, accompanied by Mr. J. L. Baldwin, an engineer, went over the proposed route for the road and, finding a summit pass of a little less than 300 feet, decided that



High trestle for embankment fill. The new line was built on a 95-foot level and across the lowlands of the Gatun Lake region a number of long and high trestles for embankment fills, some of them 90 feet high, had to be built.

it was feasible. In the early part of 1849, a party of engineers in charge of Colonel G. H. Hughes of the United States Topographical Corps, was sent to locate the line. Finding a summit ridge of 287 feet, a line was laid out not exceeding 50 miles in length from ocean to ocean, with the Atlantic terminus on Navy Bay, as Limon Bay was formerly called, and with the Pacific terminus in Panama City.

A contract was then entered into with two experienced contractors, Colonel Geo. M. Totten and John C. Trautwine, for the construction of the line. These men decided upon Gorgona, on the Chagres river, 31 miles from Colon, as the base of operations toward Panama, thinking that material could be easily landed there by boat. However, the river was so low in the dry season and so swift in the rainy season that light draft steamers were found out of the question for the transportation of railroad material. At the same time the increasing rush to the California gold fields by way of the Isthmus, made river transportation and the cost of labor prohibitive, and the contractors begged the company to release them from their obligation. This the company did, and, deciding to undertake the construction work itself, retained Messrs. Totten and Trautwine in its service.

Loading dirt train for trestle fill.

FIRST WORK ON THE PANAMA RAILROAD

Clearing on Manzanillo Island began in May, 1850. This was a low swampy plot of land of about 600 acres separated from the mainland by a narrow arm of the sea, and is the site of the present city of Colon. Although clearings had been made, residence upon the island was impossible and for the first few months the men engaged in making the surveys, and the laborers brought from Cartagena, Colombia, were obliged to live on board an old brig anchored in the bay. When this became overcrowded, as additions were made to the force, it was supplemented by the hull of a condemned steamboat. The village of Aspinwall was founded on February 2, 1852, but on account of Colombia's refusal to recognize the name, it was later rechristened Colon, in honor of Columbus.

The first seven miles of the road was through an extensive swamp, covered with jungle, and the surveyors were compelled to work in water and slime up to their waists. In a short time the entire force suffered with malarial fever, and great difficulty was experienced in obtaining sufficient laborers. Irishmen were brought from the United States, negros from Jamaica, and natives from the adjacent tropical countries, and fever made inroads on all of them. The importation of Chinese coolies was tried, and nearly 1,000 of that race were brought from China. Native hill rice, tea, and opium were supplied them, but within a few weeks disease broke out among them, and, many becoming melancholy, are said to have committed suicide, so that inside of 60 days scarcely 200 able-bodied remained. The high mortality of these Chinese laborers, probably helped develop the story that each of the ties on the original Panama railroad represented the life of a laborer. The facts in the case make the story ridiculous. There were at least 150,000 cross-ties in the original road, including sidings and yards, while the largest number of employes at any one time was not over 7,000, and the road was completed in four years. According to the most authentic records, the total mortality during the construction period was about 1,200. Added to the difficulties of maintaining a labor force, was the necessity of bringing nearly all food and supplies from New York, a distance of nearly 2,000 miles.

Scene on the Panama railroad, near El Diablo, Ancon Hill in the distance. Corozal-Ancon wagon road on the left.

By the first of October, 1851, the track had been laid as far as Gatun, and

The largest railroad bridge on the new line, spanning the Chagres River at Gamboa. It is 1,320 feet long. The Chagres River empties into the Canal at this point.

in the following month, 1,000 passengers were carried to that station from Colon. These passengers had arrived at Chagres for the California transit in two ships, but could not be landed there on account of a heavy storm, and were disembarked at Colon. This happened most opportunely for the railroad, as the original million dollars had been expended and things were beginning to look dark to the stockholders. When the news reached New York that passengers had been carried as far as Gatun, seven miles by rail, even though they had been carried on flat cars, the company's stock immediately rose in price. The work was pushed on with renewed vigor, for, from this time on, there was a small and steady income which could be applied to the construction expense. In July, 1852, the road had reached Barbacoas, a total distance of 23 miles, where it was necessary to construct a bridge 300 feet long to span the Chagres.

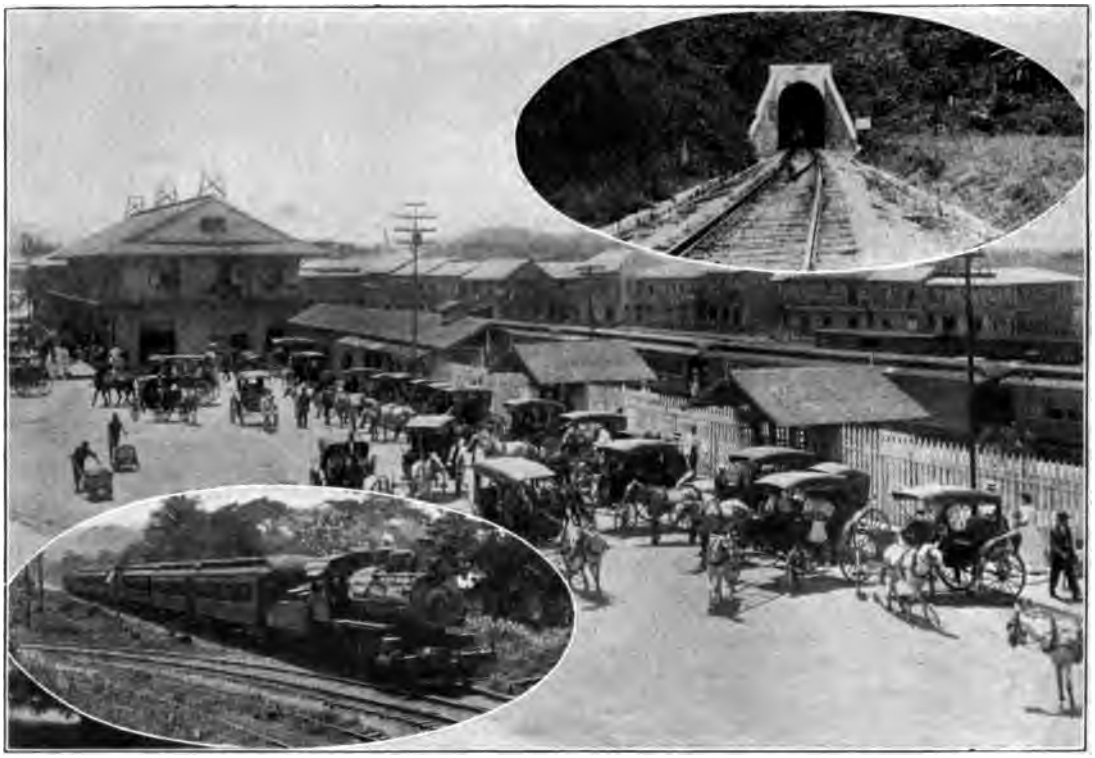
On October 10, Mr. John L. Stephens, who was president of the company, died in New York, and his successor, Mr. W. C. Young, decided to have the remainder of the work accomplished by contract. The contractor, however, failed to fulfill his obligation and after a year's delay, the company again decided to do the work.

COMPLETION OF THE ENTERPRISE

On the 27th of January, 1855, at midnight and in rain, the last rail to the summit ridge at Culebra, 37 miles from Colon and 11 miles from Panama, was laid, and in the meantime, work had been advancing steadily from Panama city, to which point material had been transported around Cape Horn. On the following day, the first locomotive passed from ocean to ocean, nearly four years after ground was first broken. The completed road was 47 miles 3.020 feet long, with a maximum grade of 60 feet to the mile, in order to surmount the summit ridge at elevation 287 feet. The first president was Mr. David Hoadley.

Although track had been laid from ocean to ocean, the railroad was in poor physical condition, and it was not until 1859 that its construction account was finally closed, at a total expenditure up to that time of $8,000,000. The road was properly ballasted, heavier rails were laid, using hardwood ties, bridges of iron replaced flimsy wooden structures, and station buildings and wharves were erected. To cross waterways, 170 bridges and culverts had been built and the wooden bridge at Barbacoas was replaced by one of iron.

The road was a paying investment from the time when the first 11 miles were opened in 1852, for, as new sections were built they were put into immediate service for passengers and freight, and at the end of 1855, the year the entire road was opened, its income from passengers and freight was $2,125,232.31. When the original construction account was closed in January, 1859, the gross earnings amounted to $8,146,605.00, while operating expenses, together with depreciation amounted to $2,174,876.51, leaving a balance of $5,971,728.66, as legitimate earnings for a period of seven years, during the last four of which the road was open throughout its entire length. Dividends have been paid every year on the stock, with the exception of a few years previous to the taking over of the road from the French Canal Company by the United States. The average dividend during the years 1852-1881 was 16 per cent., and since that period, five per cent; the smallest dividend was two per cent. in 1885, and the largest 44 per cent. in 1868. In 1865, the capital stock was increased from $5,000,000 to $7,000,000. In 1881, the year when the road was sold to the French Canal Company, a



The station of the Panama Railroad at Panama City always presents an active scene at train time. A new first class station has taken the place of the old one shown here. All passenger locomotives are oil-burning and the coaches are thoroughly up-to-date, having first and second class accommodations. The tunnel at Miraflores is 736 feet long.

dividend of 52½ per cent. was declared, but this not only represented the earnings for that year, but also included the assets and surplus on hand at that time.

EARLY RATES NEARLY PROHIBITIVE

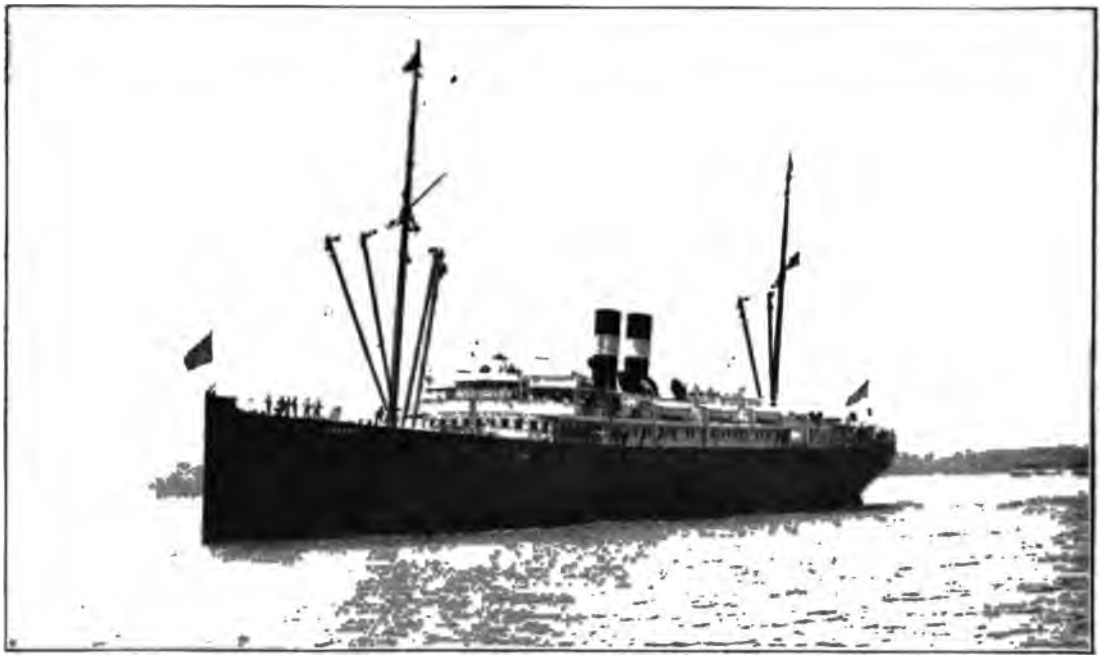
The following table of rates, placed in effect when the road was first opened in 1855, remained in force for 20 years, and following the company's policy, were intended to be prohibitive at first, on the theory that they would be lowered when the company had had an opportunity to improve its line, will explain in a measure the large profits made on this road which cost about $170,000 a mile to build:

	1885	1903	1907
Fare, Panama to Colon, 1st-class	$25.00	$5.00	$2.40
Fare, Panama to Colon, 2d-class	10.00	2.25	1.45
Charge for baggage	.10 per lb.	.02 per lb.	.02 per lb.
Freight rate, 1st-class	3.00 per cwt.	.40 per cu. ft.	.50 per cwt.
Freight rate, 2d-class	2.00 per cwt.	1.20 per cwt.	.44 per cwt.
Freight rate, 3d-class	1.00 per cwt.	.80 per cwt.	.32 per cwt.

At the present time the first-class passenger fare is $2.40, with 150 pounds of baggage free; second-class, half of that rate.

ESTABLISHMENT OF STEAMSHIP SERVICE

In 1856, the company established a steamship service between Panama and San José de Guatemala, thus opening up the rich coffee country of Central



The Panama Railroad operates a steamship service with a fleet of six vessels plying between New York and Colon, two of which were purchased in 1908 for the carrying of cement. This is the Panama, one of the passenger steamers.

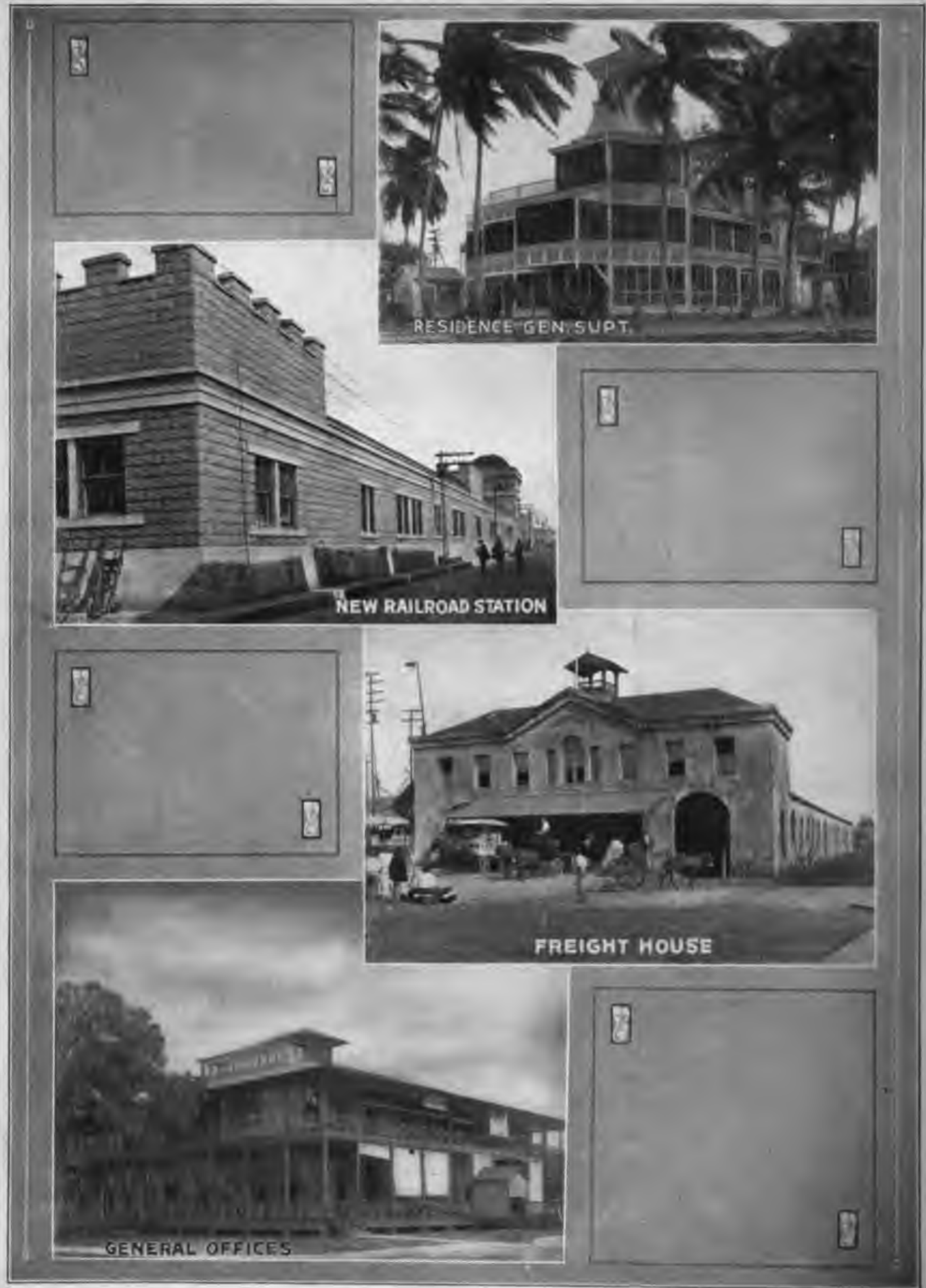
America. This line continued until October, 1872, when it was taken over by the Pacific Mail Steamship Company. At one time the road had a line of its own between San Francisco and Panama, but this was withdrawn in 1902. In 1893, the present Panama Railroad Steamship Line was established between New York and Colon, and there are now six ships in this service, the *Ancon*, *Cristobal*, *Panama*, *Colon*, *Allianca* and *Advance*, although the two former vessels purchased in 1908 are owned by the Canal Commission, and have been used mainly in transporting cement to the Isthmus.

CONCESSIONARY RIGHTS AND PRIVILEGES

The terms of the original concession granted by the Government of New Granada provided, among other things, the exclusive privilege of building a railroad on the Isthmus of Panama; that no undertaking for the opening of a canal to connect the two oceans would be permitted without the consent of the railroad company; that the railroad company should have the exclusive privilege of building wagon roads across the Isthmus and the use of the Chagres for steamer travel, and the exclusive privilege of the use of the ports at the two termini for the anchorage of vessels, and for the loading and unloading of cargo.

This concession was to remain in force 49 years from the day of the road's completion, subject to the right of New Granada to take possession at the expiration of 20 years upon the payment of $5,000,000, or at the expiration of 40 years upon the payment of $2,000,000. The provisions of the contract were modified several times, but its exclusive features remained practically the same. In 1867, it was renewed for 99 years on payment of $1,000,000 in cash, and an annual payment of $250,000 guaranteed to New Granada. The railroad also obligated itself to extend the road to the islands in the bay of Panama. This extension of the contract for 99 years was secured 12 years after the opening of the road by Colonel Totten, when it was realized that New Granada would surely raise the necessary $5,000,000 to obtain the road after 20 years of operation, a road costing $8,000,000 to build and, at that time paying 24 per cent on a capitalization of $7,000,000.

Two years later, 1869, the Union Pacific was completed across the American continent, with a consequent decline of California trade across the Isthmus. The loss of this trade would have been offset by the trade of Central and South America, had the company seized the opportunity, but its policy, apparently, was to make all it could there and then let the future take care of itself. In 1868, the Pacific Steam Navigation Company withdrew its line of steamers from the Isthmian transit, and sent its ships to England via the Strait of Magellan, and transferred its repair shops and coaling station from the island of Taboga to Callao, Peru. It was forced to do this by the shortsighted policy of the railroad's directors who refused to ratify a traffic agreement profitable to both, which had been tentatively drawn up, giving the company where freight originated the right to make a through charge to be divided equally between the three carriers, the railroad and the steamship lines on either side of the Isthmus. The steamship company took most of its trade with it and an idea of what was lost to the railroad can be obtained from the fact that, in 1874, it had 54 steamers, with a total of 124,000 tons, in operation between Valparaiso and Liverpool. Only its smaller boats were sent to Panama, and these merely to act as feeders to the main line on their return south. This policy of offering no encouragement to steamship lines also forced the Panama, New Zealand



The headquarters of the Panama Railroad are located at Colon. The new line runs on the east side of the canal and is 47.11 miles long. It was completed on May 25, 1912, at a cost of $8,984,922.18.

and Australian Steamship Company to give up its attempt to inaugurate a monthly service via Wellington to Sydney, connecting with the Royal Mail Steam Packet Company, operating between Southampton and Colon.

In spite of this policy of taking more than the trade could stand, the railroad continued to pay dividends, but it would undoubtedly have done a much more profitable business had it endeavored to help, instead of oppressing the growing trade of Central and South America.

CHANGES IN OWNERSHIP

When the French operations were begun in 1881, the French Canal Company found that in order to build a canal it would first have to gain the consent of the railroad or to purchase it. The latter plan was followed, and in June of that year, 68,888 of the 70,000 shares were obtained for a little over $20,000,000 or two and one-half times what the road had originally cost to build. In addition to the amount expended for shares, bonuses paid brought the total cost to a little over $25,000,000. When the United States, on May 4, 1904, took over the affairs of the New French Canal Company, they came into possession of these shares, and obtained the remainder, 1,112 shares, by private purchase at a cost of $157,118.24, or an average price of $140.00 per share. The entire stock of the Panama Railroad and Steamship Company is now owned by the United States, with the exception of one share transferred to each of the directors to enable them to qualify under the articles of incorporation. The Chairman and Chief Engineer of the Isthmian Canal Commission is also President of the Panama Railroad Company.

Since it has become a government-owned corporation, the road has become secondary to the Canal work, although it is still a common carrier, and carries

The railroad station at Gatun, which is the only station of a permanent type so far constructed, except at Colon and Panama City.

Old Washington Hotel, showing statue of the Panama Railroad founders, Henry Chauncey, Wm. H. Aspinwall and John L. Stephens. A new modern hotel has taken the place of the old one.

about 70,000 tons of commercial freight a month, which is about one-half of the total amount, the balance being handled for the company and for the Canal work.

When the road was turned over by the French it was found to be in a neglected condition, with obsolete equipment and rolling stock. Since that time terminal wharves, equipped with modern cargo cranes, have been constructed, terminal yards, warehouses and machine shops provided, new and powerful locomotives, 12 of which are oil burners, larger cars for passengers and freight put into service, heavier rails laid, bridges strengthened to enable them to carry the heavier equipment, and the whole line double-tracked. Permanent reinforced concrete stations have been built at Colon, Gatun and Panama, and a modern concrete hotel, the Washington, costing upwards of $650,000 has been constructed on Colon beach.

THE NEW MAIN LINE

The relocated, or new main line of the railroad runs on the east side of the canal for its entire length of 47.11 miles. From Colon to Mindi, 4.17 miles, and from Corozal to Panama, the old location was used, but the remaining 40 miles are new road. From Gatun, the line skirts the north shore of the lake for about four miles, and then turns south, crossing the eastern arm of the lake on a high trestle fill at an elevation of 95 feet above sea level. Near Caimito, the road approaches the canal again, and parallels it to Gamboa. Originally, it was planned to carry the road through Culebra Cut on a 40-foot berm, 10 feet above the water level, but slides caused the abandonment of the project, and it was built on a high level around Gold Hill instead. Its highest point is 271 feet above sea level near LaPita, and where the continental divide is crossed, opposite Culebra, the height is 241 feet. From the south end of Culebra Cut at Paraiso, the railroad runs practically parallel with the canal to Panama. Where the road crosses the Gatun River, near Monte Lirio, a steel girder bridge with a lift span has been erected to permit native sailing craft to pass into the east arm of the lake, and at Gamboa, the Chagres River is crossed with a steel girder bridge one-quarter of a mile long. At Miraflores, the road passes through a tunnel 736 feet long.

The new line was completed on May 25, 1912, at a cost of $8,984,922.18, but passenger trains were not run over it for its entire length until September 2, 1913, when the former crossing at Gamboa dike was abandoned on account of the rise of Gatun Lake. On that date a new schedule was placed in effect, whereby the main line trains run all the way from Colon to Panama on the east side of the canal, and the towns on the west bank are served with a shuttle train service from Panama to Bas Obispo, the present terminus of the old double-track line. The shuttle trains now cross the canal, near Paraiso on a trestle bridge, but as this will have to be removed to permit the navigation of the canal, a wooden pontoon bridge will be built in the same locality of sufficient width for a single track and a roadway for vehicles. This is not intended for a permanent crossing but only to such time as the villages on the west bank of the canal can be abandoned. South of Corozal, a change will be made in the road which will have the effect of placing the new town of Balboa on the main line, with its terminus at Panama as at present. The railroad possesses modern passenger terminals at both ends. The one in Colon is of concrete block construction, and was opened on July 23, 1909. It is not particularly attractive from an architectural standpoint. The new station in Panama, costing about $100,000, was completed in the latter part of 1913. The only other station of a permanent type so far constructed is at Gatun, built in 1909.

The new Hotel Washington at Colon. Cost about $500,000.
Operated by the Panama Railroad.

The total mileage of the road, exclusive of sidings, is 58.79, as follows: Main line, 47.11 miles; Pedro Miguel to Bas Obispo, 9.12 miles, and Panama to Balboa 2.56 miles.

BUSIEST SHORT LINE IN THE WORLD

During the years 1911-1912 the road carried 777,121 first-class passengers, and 1,980,550 second-class passengers, an increase of over 300,000 for the year. During the fiscal year just closed, the passenger traffic is expected to show material increase due in part to the increased tourist travel. Freight amounting to 1,871,076 tons was transported over the railroad during 1911-1912, divided as follows:

	Per cent.
Through commercial freight	36.80
Local and I. C. C. freight	49.93
Local commercial freight	10.37
Panama Railroad Company's freight	2.90

The net revenue from its operation was $1,997,280.80. The steamship line, on the other hand, has not paid as an investment, except as a feeder for the railroad, and for the benefit of the Isthmian Canal Commission. It has had a steady freight and passenger traffic, but the cargoes have consisted principally of canal supplies, and the passengers have been mostly employes of the Canal Commission and railroad, who are carried at a reduced rate. The net deficit from the operation of the steamship line for the fiscal year ending June 30, 1912, was $305,742.85.

With the completion of the canal it is possible that the road will be electrified, obtaining the necessary power from the hydroelectric plant at Gatun spillway, and will be devoted almost entirely to local traffic. This traffic will, no doubt, be considerable, for Colon and Panama will always be important cities.

New Panama railroad passenger terminal in Panama, just completed.

THE FRENCH FAILURE

THE French attempt to construct a waterway across the Isthmus was foredoomed to failure because the project fell into the hands of promoters and speculators. A contributory cause was the very high sick and death rate among the French employes on the Isthmus. This added greatly to the cost of administration and resulted in an unstable labor force. Many of the best engineers left the Isthmus after short service, or died, and these constant changes made it difficult to pursue any regular plan to keep up an effective organization to carry on the work. The company had to pay high wages and offer special inducements to persuade men to take the chance of one in five of surviving an attack of yellow fever which they were liable to contract. Had the work been in charge of a rich and powerful government, public opinion would not have allowed the work to have been carried on at such an appalling cost of life. When the enterprise was started the method of transmission of malaria and yellow fever was unknown, and, even if the French had taken the sanitary precautions prevailing at that time, they could not have stamped out these two fevers which gave the Isthmus the reputation of being the most unhealthy place in the world for a white man. As a private corporation, it could not enforce sanitary regulations had it desired to do so, for, unlike the United States, it did not acquire absolute jurisdiction over the Canal strip, but was at the mercy of the Colombian courts.

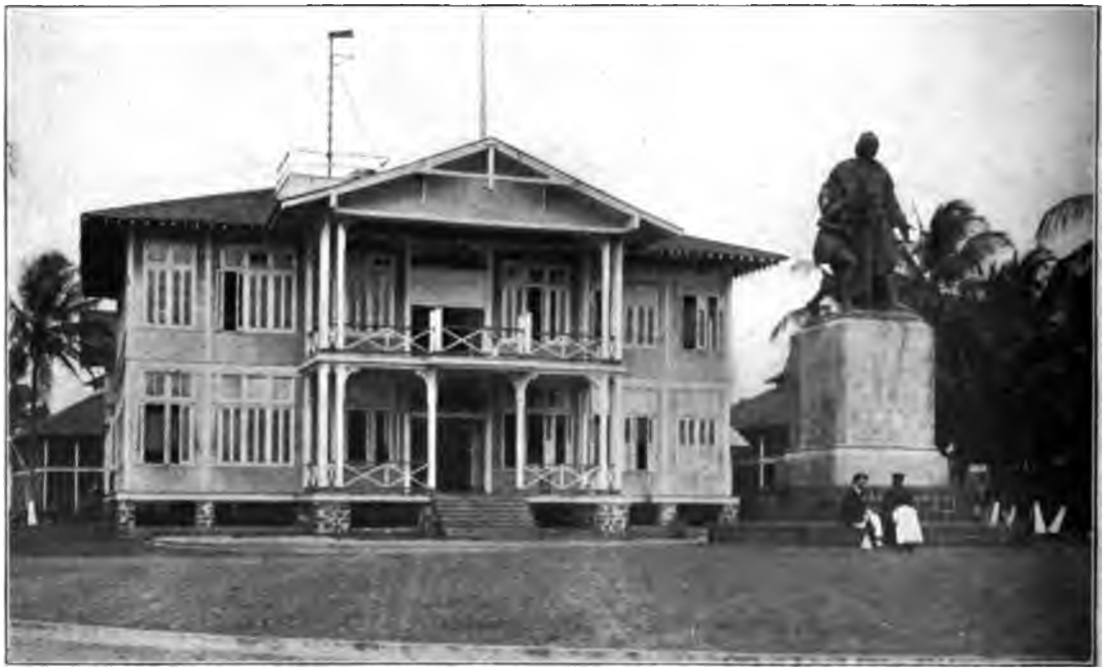
Other causes were extravagance, which naturally developed into graft, for the supply of money which came flowing into the coffers of the company from eager investors beguiled by the name of De Lesseps seemed inexhaustible; the lack of suitable machinery, the want of preparation, and misguided leadership. All these mistakes have served as warning signals to the Canal Commission, so that the failure of the French has contributed, in a large measure, to the success of the Americans.

DE LESSEPS—PROMOTER

The first French Canal Company, La Societe International du Canal Interoceanique, inaugurated the undertaking with an exclusive concession from Colombia, but with an incomplete survey of the proposed work, and an estimate of cost and time placed much too low. The necessary money was

Count Ferdinand de Lesseps. His name will always be linked with the great enterprise as it was under his direction and control that the work first took definite form.

obtained from the French middle classes, who were induced to part with their savings through the magic name of Ferdinand de Lesseps, who had just brought to a successful close his great work at Suez, and who was placed at the head of the new enterprise. De Lesseps was honest and sincere, but he was an old man, somewhat blinded by his previous good fortune, and, therefore, easily deluded. He was enthusiastic over the idea of a canal connecting the Atlantic with the Pacific, and made himself and others believe that the work could be accomplished more quickly and much easier than the Suez. His ability as a missionary made him valuable to the promoters, for the difficulties of the work across the Isthmus, as compared with the work at Suez should have been apparent even to the layman. He was not an expert engineer; it did not require any engineering ability, but merely imagination, to see the practicability of cutting a sea level channel through the low desert region of upper Egypt, while at Panama, a hilly and



Former headquarters of De Lesseps, Cristobal, now used by the Canal Commission.

rock country had to be traversed, torrential streams diverted, and a tidal basin constructed, problems which the world's foremost engineers have differed in the solution. And yet De Lesseps sincerely believed that he was to achieve a second triumph, and much easier than his first. (The Suez Canal was opened in 1869, took ten years to build, and cost about $100,000,000, or a million dollars a mile. This low cost was due to the fact that the cut was made through a stretch of level sand, and Said Pasha, the Khedive of Egypt, a large stockholder in the enterprise, practically forced his subjects to work on the project in much the same manner as Rameses of old).

PROCURING THE CONCESSION

The concession for the privilege of constructing the Canal was obtained from Colombia in May, 1876, by General Stephen Türr, a Hungarian, who had become acquainted with De Lesseps when the latter was planning his work at Suez, and who was later incited by the Frenchman's success in an effort to duplicate the feat at Panama. He organized a provisional company in France and sent an engineering party to the Isthmus in November, 1876, to make explorations and surveys. The party was in charge of Lieutenant Napoleon Bonapart Wyse, of the French Navy, a brother-in-law of General Türr, and at that time only 23 years of age. The first expedition was only partly successful, several of its members falling victims to disease. Wyse was again sent out in the spring of 1878 with Lieutenant Armand Reclus, also of the French Navy. On this trip he obtained a new concession, approved May 18, 1878, in the name of the association presided over by General Türr, which modified and extended the former one, so as to give the promoters the exclusive privilege of building a canal across the Isthmus anywhere within the United States of Colombia. This concession was to remain in force 99 years, provided the necessary permission was obtained from the Panama Railroad Company which held a

The old port of Colon in 1884, during the early French days. This photograph was taken with a wet plate, a relic of photography.

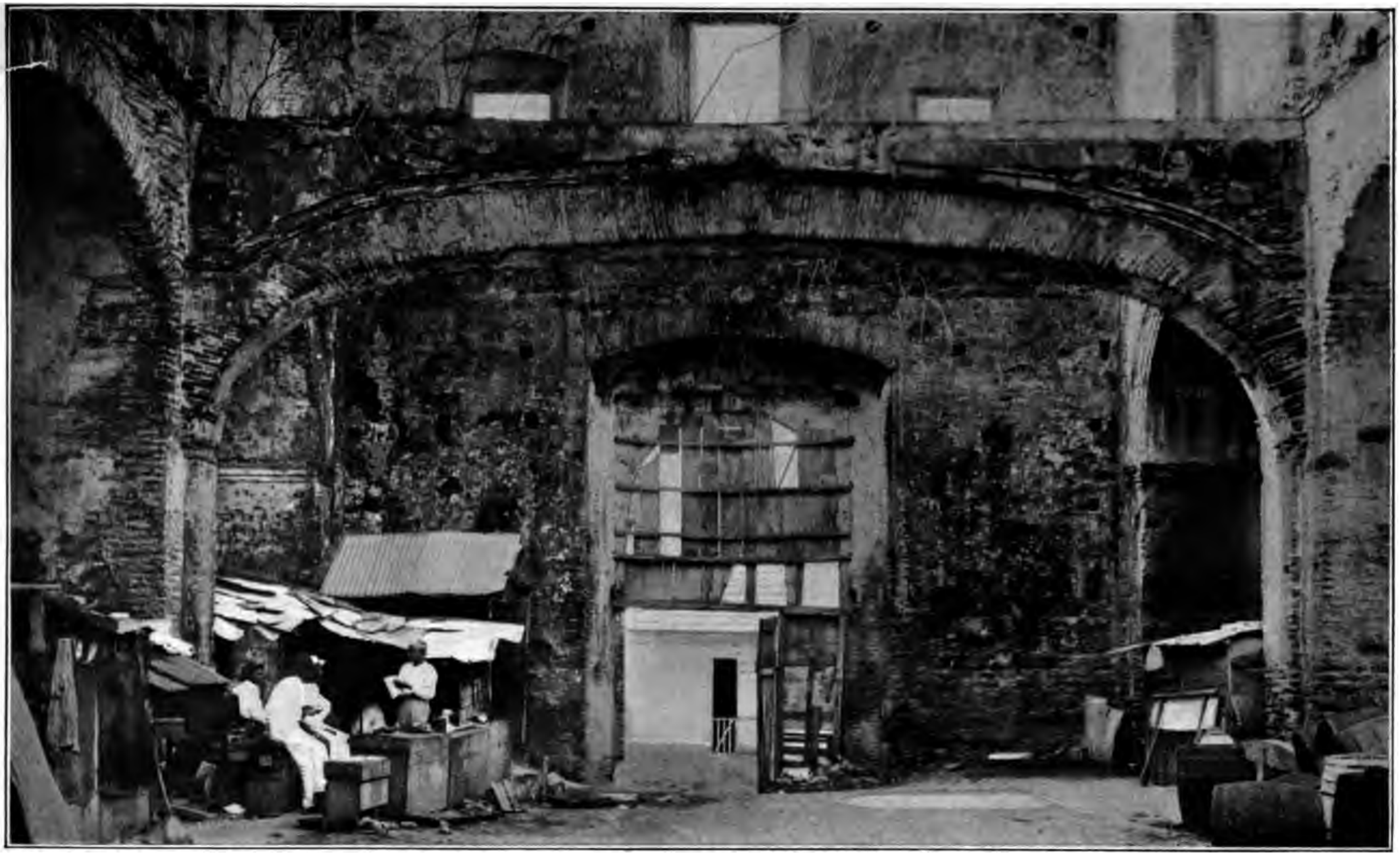
Cristobal street scene in the French days. The scenes of the old French days have changed with newer ideas. This section is now filled with roomy houses and quarters for the canal employes and I. C. C. manufacturing plants.

monopoly of the Isthmian route. Work was to be begun not later than 1883, and was to be completed within 12 years, with an extension of six years in case the original term proved too short.

Although Wyse went over not more than two-thirds of the distance from Panama to Colon, he submitted what were supposed to be complete plans and a statement of cost for a sea level canal between the two points, following the line of the Panama railroad. These plans and estimates were submitted to an international engineering congress which was convened in Paris, May 14-29, 1879, in accordance with the terms of the concession, with Ferdinand de Lesseps at its head. These plans were the basis of a decision by the congress in favor of a sea level canal, following the route of the Panama railroad, by way of the pass at Culebra, using the valley of the Chagres river on the Atlantic side, and the valley of the Rio Grande on the Pacific side of the continental divide. It is pertinent to note that in this congress, consisting of 136 delegates from France, Germany, the United States and other countries, only 42 were engineers, while the remainder were promoters, politicians, speculators, and personal friends of De Lesseps. The Wyse concession and plans were "shoved through," approved, and turned over to La Societe International du Canal Interoceanique, commonly known as the first French Canal Company, for a consideration of $2,000,000. This was the first "step in the dark," taken by the company.

DE LESSEPS' PLAN.

De Lesseps made two visits to the Isthmus, the first in December, 1879, and the second in 1886, remaining for about two months on each occasion. On his first visit he was accompanied by his wife, three of his children, and an international technical commission, consisting of nine members. At one of the

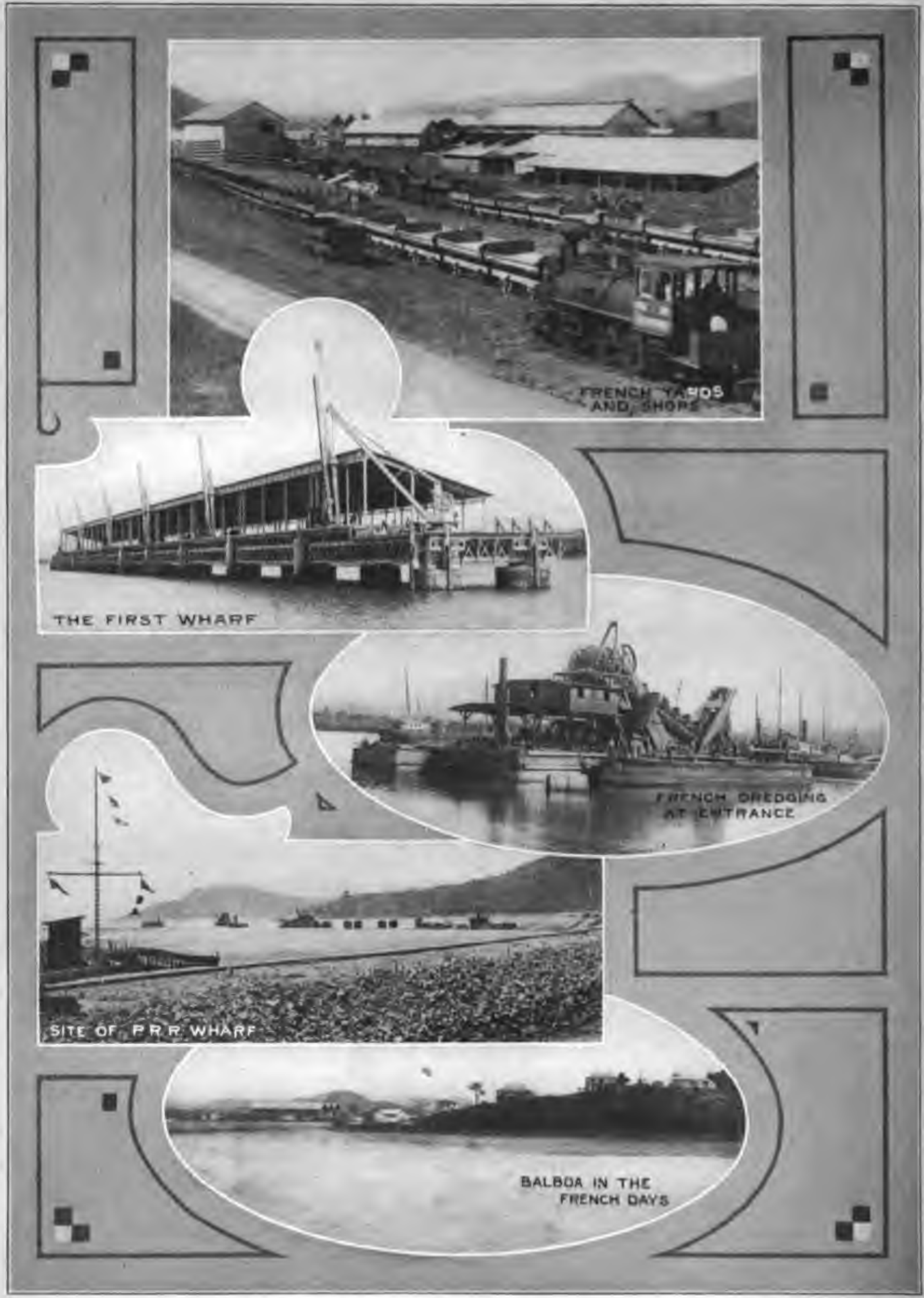


The famous flat arch in the ruins of Santo Domingo Church, Panama City. It is an architectural curiosity of the early day Spanish masons and has withstood the assault of fire and earthquakes. It has a span of over 40 feet, and a rise of two feet, and has stood in the ruins of the old church for 206 years.

numerous receptions and banquets tendered him, he said: "There are only two great difficulties to be overcome, the Chagres River, and the deep cutting at the summit. The first can be surmounted by turning the headwaters of the river into another channel, and the second will disappear before the wells which will be sunk and charged with explosives of sufficient force to remove vast quantities at each discharge."

The engineering commission, after a superficial study of the route and former incomplete surveys, in a report submitted February 14, 1880, estimated the cost at $168,600,000. The engineering congress estimated the cost at $214,000,000. On February 20, De Lesseps reduced this estimate to $131,600,000, and again on March 1, without apparent reason, to $120,000,000. The proposed sea level canal was to have a uniform depth of 29.5 feet, a bottom width of 72 feet, and a width on the water line of about 90 feet, and involved excavation estimated at 157,000,000 cubic yards. The engineering congress estimated seven or eight years as the time required to complete the work. De Lesseps, with his usual optimism, reduced the time to six years. To control the floods of the Chagres River, various schemes were proposed, the principal one being the construction of a dam at Gamboa, a little below Cruces, and the construction of channels to the sea to carry the impounded water away from the canal. On account of the great difference in the tides of the two oceans, a maximum of two and one-half feet in the Atlantic and 21 feet in the Pacific, a tidal basin or lock was to have been built at the Pacific entrance. (The high tide on the Pacific side is due to the fact that the Bay of Panama is funnel-shaped). No work was ever accomplished on either of these two

Front Street, Colon, during the flourishing French days, with the pay car at the old depot.



A group of views of Balboa and the canal entrance and operations, during the days of both the First and Second French Companies. The wharf was the first constructed by the French. The one-sided dump cars shown in the top picture are now obsolete.

projects. A dam at Gamboa was found later to be impracticable, and the problem of the diversion of the Chagres River was left to some future time.

INAUGURATING THE WORK

On January 1, 1880, the ceremony of breaking the ground was to have been performed by De Lesseps at the mouth of the Rio Grande, about three miles west of Panama city. The boat bearing a party of ladies and gentlemen who were to take part was delayed in starting, with the result that it could not get within two or three miles of the shore on account of the ebbing tide. This, however, did not dampen the ardor of the versatile Frenchman, as the arrival of the steamer in the entrance of the river mouth was considered by him a sufficient beginning. The first blow was thereupon struck with a pick in a box of earth upon the deck of the steamer, while the observers aided their imagination by copious draughts of champagne. On January 10, 1880, De Lesseps, with another party of civil and church dignitaries, went to Culebra to witness the first blast. Accounts differ as to this event. Tracy Robinson, the oldest American on the Isthmus, states in his book on Panama, that the blast never came off, and as he was present, he ought to know. On the other hand, the "Star and Herald" of the day following gives a circumstantial account of the affair, ending with: "The mine had been carefully laid in an exceedingly hard and compact formation of basalt at a few feet below the summit, and charged with 30 kilograms of explosive. The operation was performed with complete success, and immense amount of solid rock being hurled from its original position." No photographs of the incident are extant.

Limon Bay in the busy French days.

Actual excavation work did not commence in Culebra Cut until some time

The pick and shovel brigade.

later. "The Bulletin du Canal Interoceanique," published by the company for the benefit of the stockholders, of February 1, 1882, states: "The first work in the great cut of the maritime canal was formally inaugurated today (Jan. 20, 1882), at Empire in the presence of the dignitaries of the state, the leading citizens of the city and a great assemblage of the people. The first locomotive has arrived at the newly opened excavation. The city of Panama is celebrating the event with a great fete."

De Lesseps left Colon for the United States on February 22, 1880, for the purpose of interesting Americans in the undertaking. Although he was received with a great deal of enthusiasm everywhere, he was unable to dispose of the stock which he had thoughtfully reserved. Americans were interested in a canal, but not in a canal under French control. He then proceeded on a similar tour of Europe, where he was more successful from a pecuniary point of view. The first issue of stock, 600,000 shares of $100 each, was subscribed twice over, mostly taken in France. These shares were distributed among 100,000 persons, indicating the great Frenchman's popularity with the people of his country. In 1888, when the company failed, the total subscriptions, stocks and bond issues, had reached $393,505,100, and the shareholders numbered 200,000.

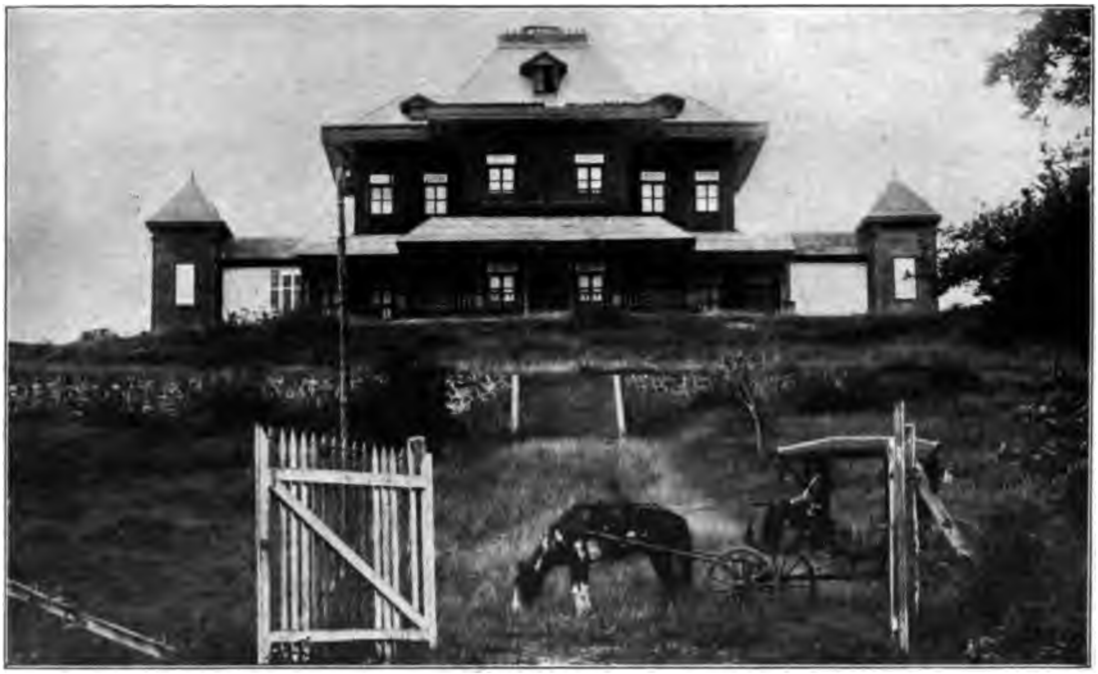
Two years of feverish preparation followed which witnessed the making of hasty surveys, the bringing together of machinery and a labor force, and the erection of quarters and hospitals. The actual construction work was let to a firm of French contractors, Couvreaux & Hersent, but they soon realized the difficulties of the undertaking and withdrew from the last part of their contract.

FRENCH LABOR FORCE

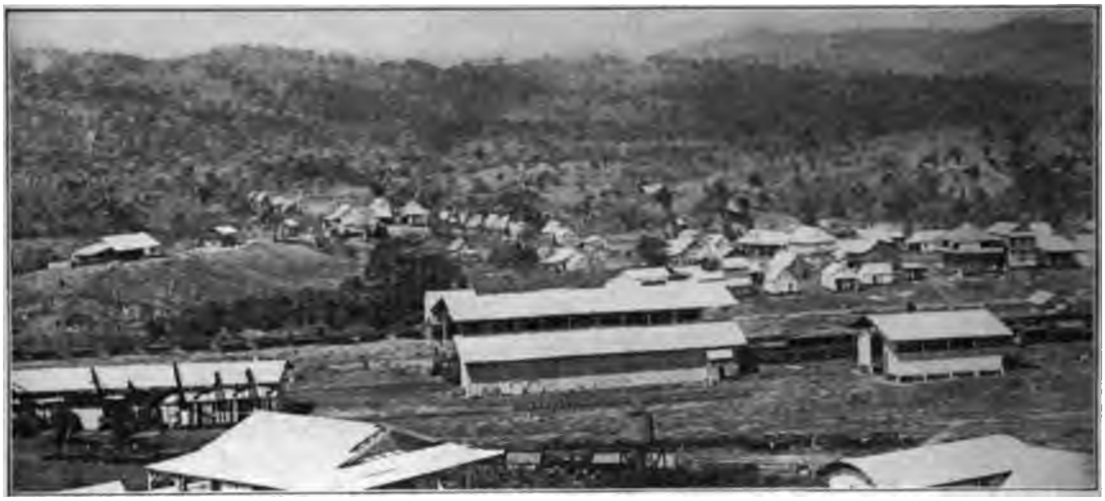
There seems to have been little difficulty experienced in obtaining a labor force, which in 1888, numbered about 20,000 men. Nine-tenths of these were negroes from the West Indies, and many of them held clerical and other similar positions. The white employes, mainly from France, were treated with extreme generosity. Economy was an unknown factor in the administration of affairs of the first company. The average pay of a clerk was $125 per month, and of a division chief from $200 to $300 per month. After two years' service, five months vacation, with free traveling expenses to and from France, were granted. The hours of labor for the clerical force was from 8 to 11 a. m., and 2 to 5 p. m., six hours a day. Free quarters, furniture, bedding, lamps, kitchen utensils, etc., were provided. As there was no system of accounting in vogue, many did quite a profitable business in the buying and selling of the company's furniture. This was merely one of the petty forms of graft in vogue, however. Enormous salaries were paid to the directors, engineers, and other officers on the Isthmus. The director-generals lived in a house that cost $100,000, now used as the American Legation in Panama City; they received $50,000 a year, and when they went out on the work they were allowed $50 a day additional. One of the private cars in which they rode cost $42,000.

LA FOLIE DINGLER

There formerly stood on an artificial terrace on the western slope of Ancon Hill a building that commanded ready attention from passersby on the road from Panama to La Boca, now Balboa. It was the prospective home of M. Jules Dingler, probably the foremost director-general of the first French company, prospective, because he never occupied it. Work on the mansion was begun shortly after he came to the Isthmus in February, 1883, and the cost including the grounds is said to have been about $50,000. For many years

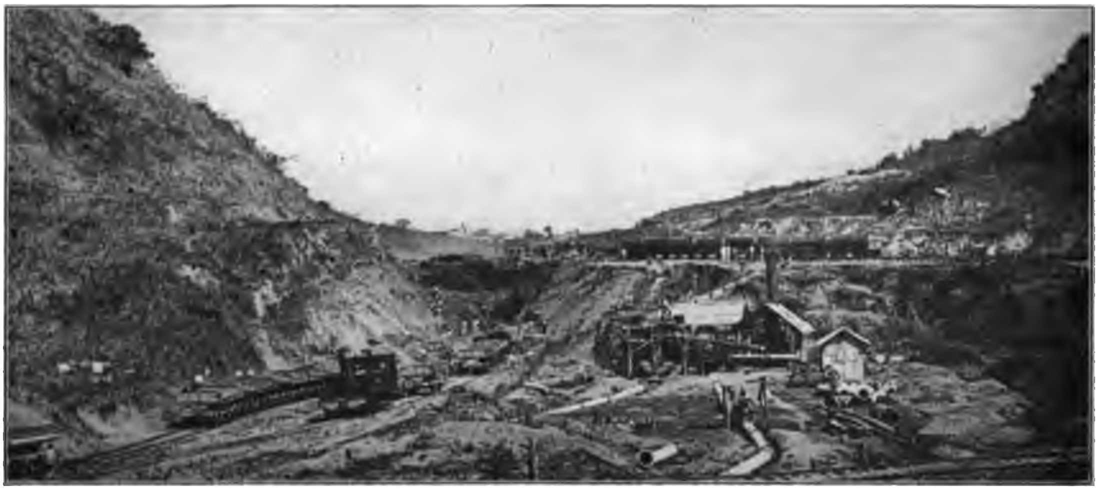


La Folie Dingler, built for M. Julius Dingler in the first French Company's days, but never occupied by him. The experience of M. Dingler on the Isthmus constitutes one of the saddest incidents in French canal history. His son, daughter and wife all contracted the dreaded yellow fever and died.

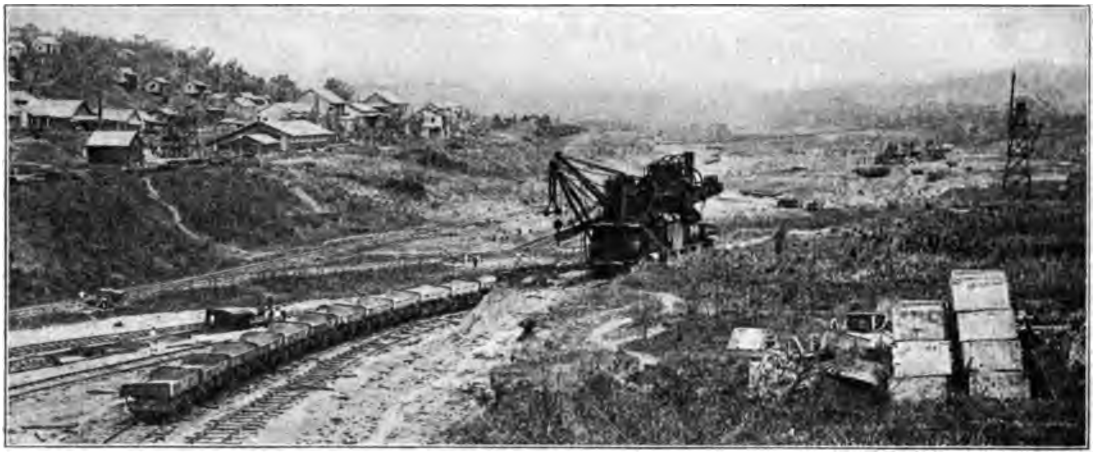


The village of Empire in the old French days. The French began their first excavation in the cut near this point in 1882.

it had been called La Folie Dingler, or Dingler's Folly. The experience of M. Dingler on the Isthmus constitutes, perhaps, one of the saddest incidents in French canal history. Stories of the fatal effect the climate of the Isthmus was said to have on foreigners reached France, but Dingler scoffed at these reports. "I am going to show them," he is credited with having said, "that only drunkards and the dissipated contract yellow fever and die." In this spirit he brought with him to the Isthmus, his wife, son, and daughter. His son, who was made director of posts, shortly fell victim to yellow fever and died. Dingler subsequently went to France on leave of absence, and upon the return of himself and family to the Isthmus, his daughter met with the fate of his son. On his return from a second trip to France, his wife also sickened and died from the same fell disease. Dingler later relinquished his post and went back to France a man broken in mind and body. At the time the American Government took possession, La Folie Dingler had fallen into partial decay. Needed repairs



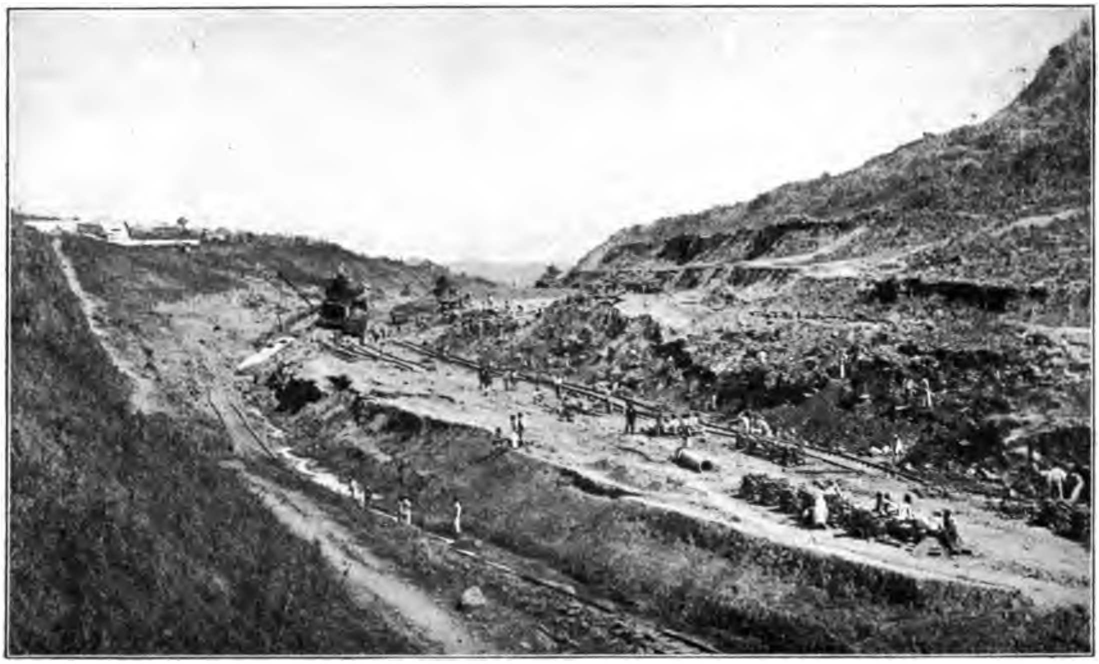
The French at work in the Canal at Cucaracha, 1885, just around the point from Gold Hill.



Canal between Empire and Culebra, showing the French method of excavation, in 1888.

were made and for several years the building was utilized as a detention station for the quarantine service. It was sold in 1910 for $525, and removed to make way for quarry work on the side of Ancon Hill.

During the period of greatest activity there were probably 2,000 Frenchmen on the Isthmus, all non-immune to yellow fever. Life was a gamble and, with no suitable social diversion, they naturally resorted to the only forms of amusement available, the saloons, gambling rooms, and houses of ill-repute. Colon and Panama became the Mecca of the parasites of society, the non-workers who live on vice, with the result that an efficient labor force could not be kept long under such conditions, and it was continually changing.



In the center of the Cut at the end of the first French Company's days, 1889. The first French Company operated from 1881 to 1889.

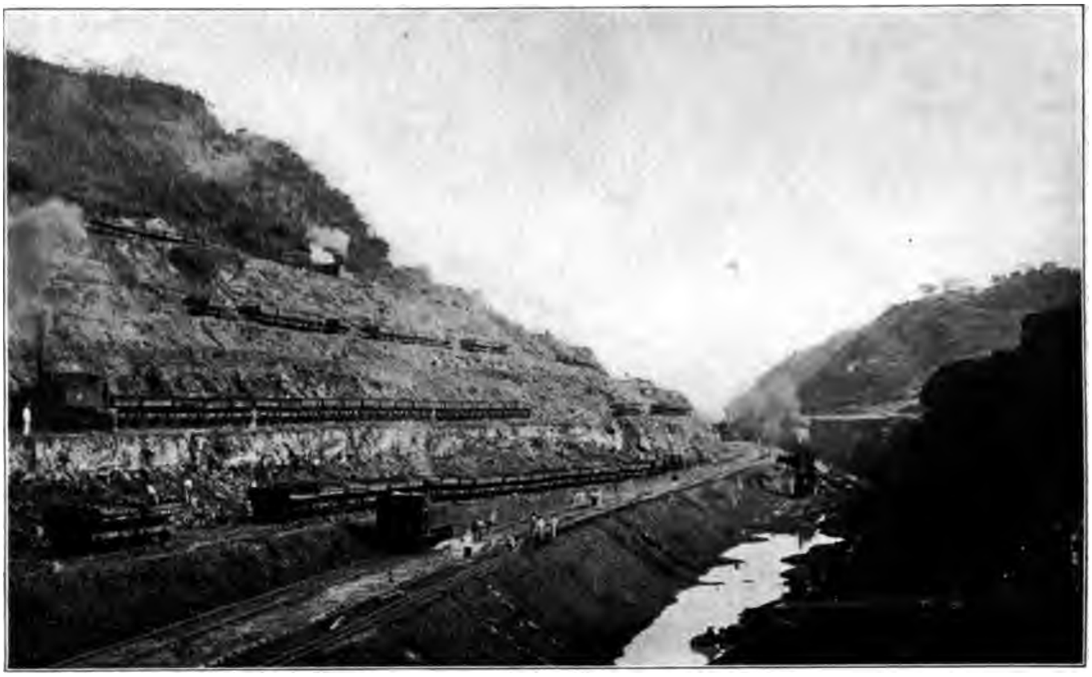
Culebra Cut in the earliest times of the second French Company, 1894.

THE SICK POORLY CARED FOR

Two hospitals were built in 1883, which, with additions and alterations have been in constant use by the Americans. Ancon hospital originally cost $5,600,000, and Colon hospital cost $1,400,000, a total of $7,000,000.

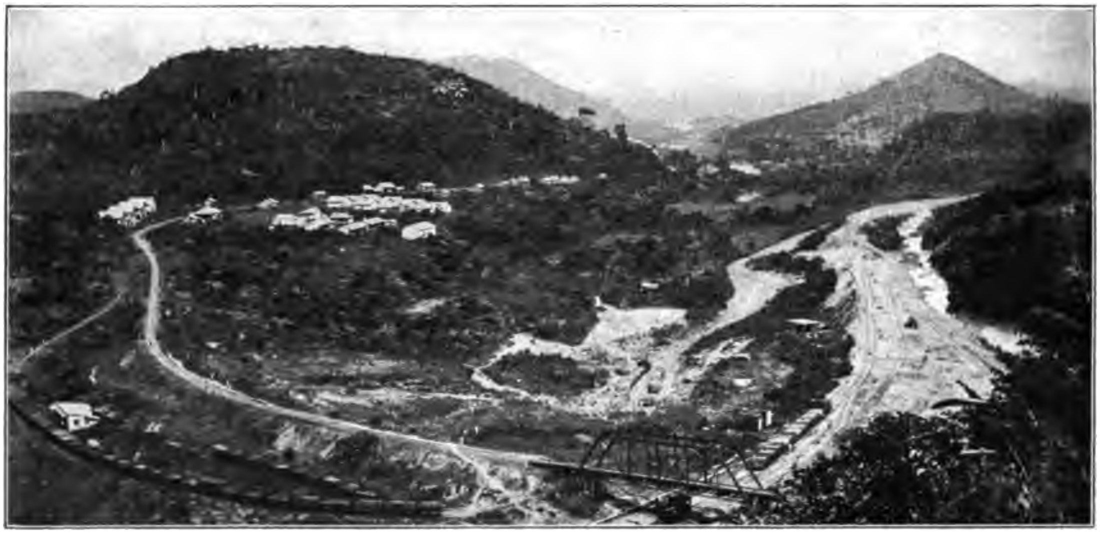
The hospitals, although fairly well equipped, with excellent doctors and surgeons and supplied with the best medicines and instruments of the time, were poorly managed. They were handled under contract, and the administration

Looking South from Culebra in the second French Company's days, 1895. The second French Company operated from 1894 to 1904.



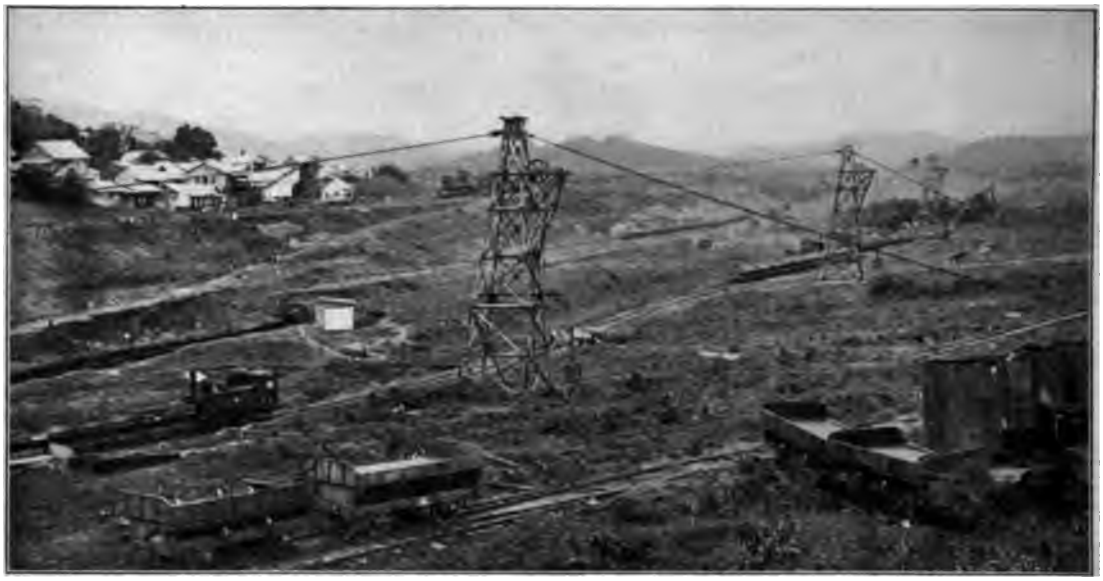
The Cut as it appeared in 1904 when the Americans began the work. Contractor's Hill on the right; Gold Hill on the left. Note the succession of benches, lying one above the other. The Americans have followed this same method in excavating.

was left almost entirely to French Sisters of Charity, who, although they were devoted and religious women, were not trained nurses. These worthy women left the wards at night after prayer, closing the doors and windows tight to keep out the night mists, which were supposed to bring malarial fever, leaving the patients without any other care than that which was given by the less feeble among themselves. When the wards were opened for morning prayer it was



The valley of the Rio Grande in the French days. The present canal is between the hills. The old Panama Railroad bridge is shown at the south end of the Cut.

often found that some patient had died during the night, who might have been saved with proper attention. The legs of the hospital beds were placed in tins of water to keep insects from crawling up. These pans of stagnant water, and also the many ornamental basins containing flowers and plants in the grounds outside made ideal breeding places for mosquitoes, and it is quite probable that many patients fell victim to fever while in the hospital suffering with some minor illness, due to the unscreened windows and doors.



The Cut in French times, showing their cableway plan of excavation. These cableways carried the material out of the canal and deposited it to one side, but unfortunately not far enough, for much of it has slid back into the Cut, causing extra excavation.

The hospital records show that during the construction period of the old company—1881 to 1889—there were 5,618 deaths, 1,041 of which were from yellow fever. The old yellow fever ward in Ancon hospital, now ward No. 16, was called St. Charles, and it is believed that more people died from yellow fever in it than in any other one building in the world. The West Indian negroes were immune to yellow fever, and very few of them were admitted to the hospitals. The victims, therefore, were nearly all white persons, and mostly Frenchmen. A large proportion of the sick did not enter the hospitals, as the contractors were charged one dollar a day for skilled medical treatment of employes. Colonel Gorgas estimates the number of laborers who died from 1881 to 1889 at 22,189, or a rate of something over 240 per thousand per year. He also estimates that as many died of yellow fever outside the hospitals as in, and places the total number of deaths from that disease at 2,082. In September 1884, during an attack of yellow fever, the Canal Company lost 654 employes out of a force of about 18,000. This is in part based on surmise, for the truth was partly suppressed or minimized by the Canal Company in order not to destroy the confidence of the people in the project, and outside of the hospital rolls, the records were incomplete. A virulent form of malaria, known as "Chagres fever," caused a greater toll in lives than any other one disease. The negro laborers, although immune from yellow fever, succumbed quickly to attacks of this form of malaria.

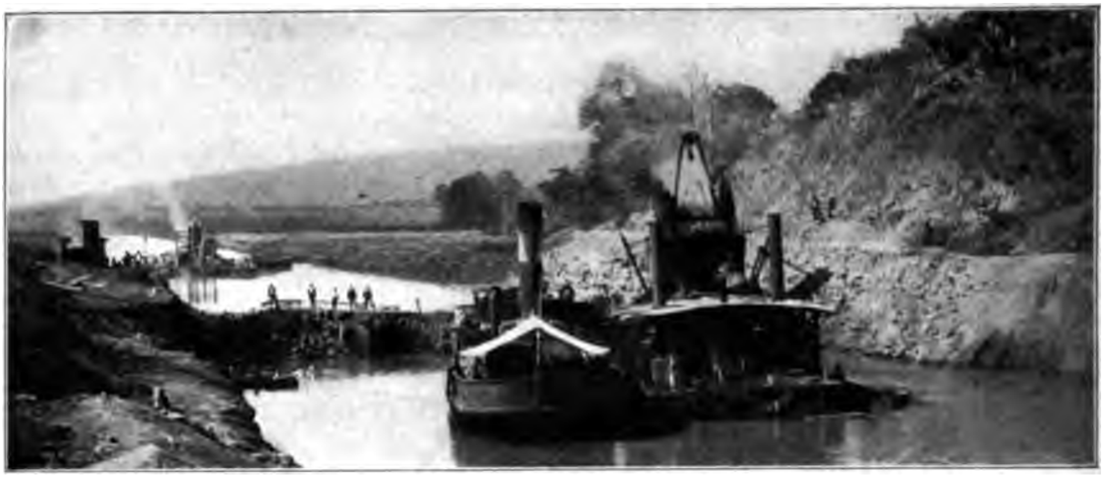
Under the new canal company, the hospitals were turned over to the Sisters of Charity who took care of the few patients admitted at a fixed charge. As the revenue from patients was small, they had a hard time to keep them open at all, and were compelled to sell flowers, fruits, vegetables and other products from the hospital grounds. When the Americans took charge these women were replaced by trained nurses.

THE CRASH

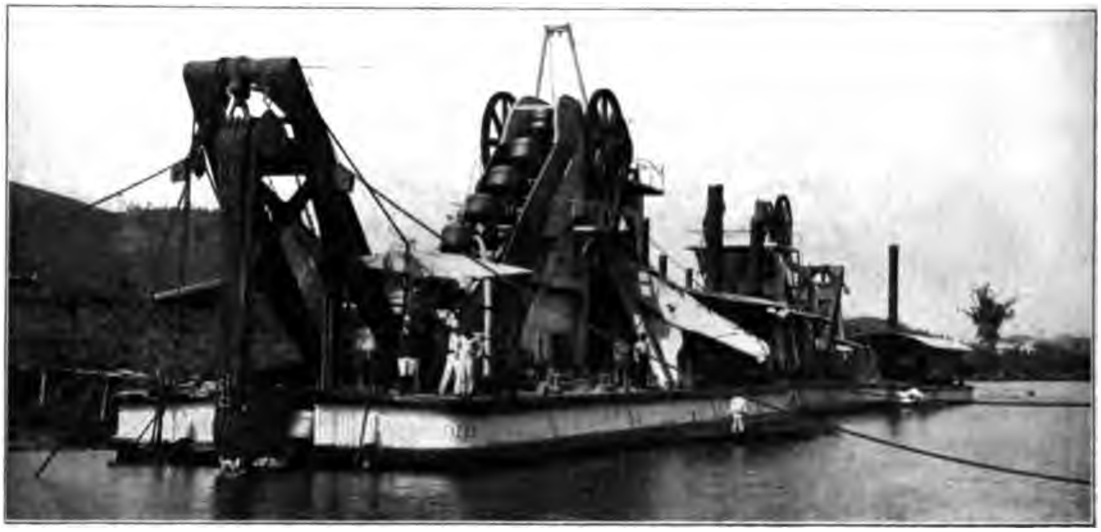
The crash came in December, 1888. At this time $156,654,687.00 had been expended on the Isthmus, and in Paris, $78,140,330.00, a total of $234,795,017.00. This vast sum is said to have been "one-third expended on the canal work, one-third wasted, and one-third stolen." Of that spent at Panama, salaries and expenses of management aggregated $16,540,883; rents and maintenance of leased property, $3,301,070; material and supplies, $29,722,856; buildings, $15,397,282; construction and engineering expenses, $89,434,225; land purchases, $950,655; and medical and religious attendance, $1,836,768. In view of the various forms of graft, extravagance and waste, it is not surprising that there was so little to show in actual work accomplished. At the end of eight years the work was about two-fifths completed.

A French excavator opening a pioneer trench in the south end of the Cut. This was the best known method of excavating in that day.

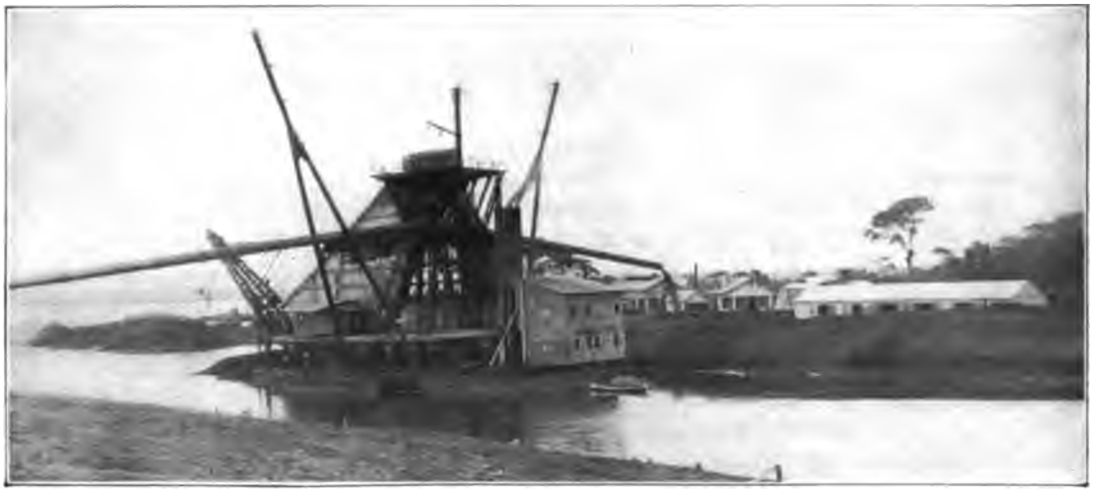
The work was let to contractors, very few of whom faithfully performed the service for which they were paid. Many made small fortunes. Those who were intrusted with the work of excavation were paid for the amount of spoil which they took from the canal prism. As there was no data available on the cost of such work, it was impossible to even estimate what the charge should be. In many cases the contractors took out what was most easily excavated, avoiding the hard spots. One notable exception to this was the dredging work done by the American Dredging and Contracting Company, which dredged the opening of the Canal from Colon to beyond Gatun.



First French Company's days. Dredges working in the canal at Mindi.



Two French ladder dredges working on the Chagres River, opposite Gorgona 20 years ago.



The French suction dredges with the carrying pipes, were effective in excavating, but like their cableways, did not carry the spoil far enough.

Much worthless material was shipped to the Isthmus, due to ill advised buying, the French manufacturers undoubtedly in many instances cleaning house to their profit at the expense of the Canal stockholders. When the Americans took over the property they found torch lights in one storehouse apparently brought to the Isthmus to be used in the celebration of the opening of the Canal. At another time a lot of wooden shovels, made from one piece, were brought to light. They have been referred to as snow shovels, but were evidently intended for handling sand or ashes. A ton or more of rusted pen points found in the stationery store furnished additional proof as to where some of the money went.

Early in 1885, it became apparent that the Canal could not be completed under the sea level plan within the time or estimated cost. During the previous year the promoters foresaw the end, and began to sell their stock. M. Leon Boyer, who succeeded Dingler as director had time to report before his death from yellow fever a few months after his arrival on the Isthmus, that the canal could not be completed by 1889, and to submit a plan for a lock canal. In May, 1885, M. De Lesseps asked the French Government for authority to issue lottery bonds for a loan of $120,000,000, to replenish the depleted treasury. Before granting permission, the Government sent out M. Armand Rousseau, an eminent engineer, to investigate conditions. He reported that the canal could not be finished within the time and cost estimated unless changed to the lock plan. Similar reports were made by an engineer sent out by the company, and by the agent of the Colombian Government on the Isthmus, the latter stating that the canal could not be completed before the expiration of the concession in 1892. In February, 1885, Lieutenants Winslow and McLean of the United States Navy, reported that there remained to be excavated 180,000,000 cubic yards; that the work would take 26 years at the then rate of progress, and that the cost would total $350,000,000.

Old French dump cars. Steel cars, 18 feet long, were used exclusively. The cars dumped on one side only, and were too small for economical use. Most of these were scrapped by the Americans.

M. De Lesseps withdrew his request for permission to issue lottery bonds, but would not consent to a change in plans. He obtained temporary financial relief by the issue of bonds to the value of about $70,000,000, but as money again began to get scarce, he consented to a change in plan, and in October, 1887, a temporary lock canal, with summit level above the flood line of the

Chagres River, to be supplied with water by pumping, was decided upon. Under the new plan, it was estimated that the cost would reach $351,000,000 and would require 20 years to build. There had already been spent at this time nearly $250,000,000, and only about two-fifths of the work had been accomplished. The end was in sight.

Work was pushed forward under the new plan until May, 1889, when the company became bankrupt and a liquidator was appointed to take charge. Under the liquidator, the work gradually diminished and was finally suspended on May 15, 1889. It was soon realized that the only way anything could be saved to the stockholders was to continue the project. Late in 1889, the receiver appointed a commission composed of French and foreign engineers, eleven in number, to visit the Isthmus and determine whether or not the canal could be completed. This commission reported on May 5, 1890, that a lock canal might be completed within eight years at a cost of $174,600,000. It reported that the plant on hand was in good condition and would probably suffice for completing the canal. It also estimated the value of the plant and the work already accomplished at $87,300,000, or one-half of the total cost.

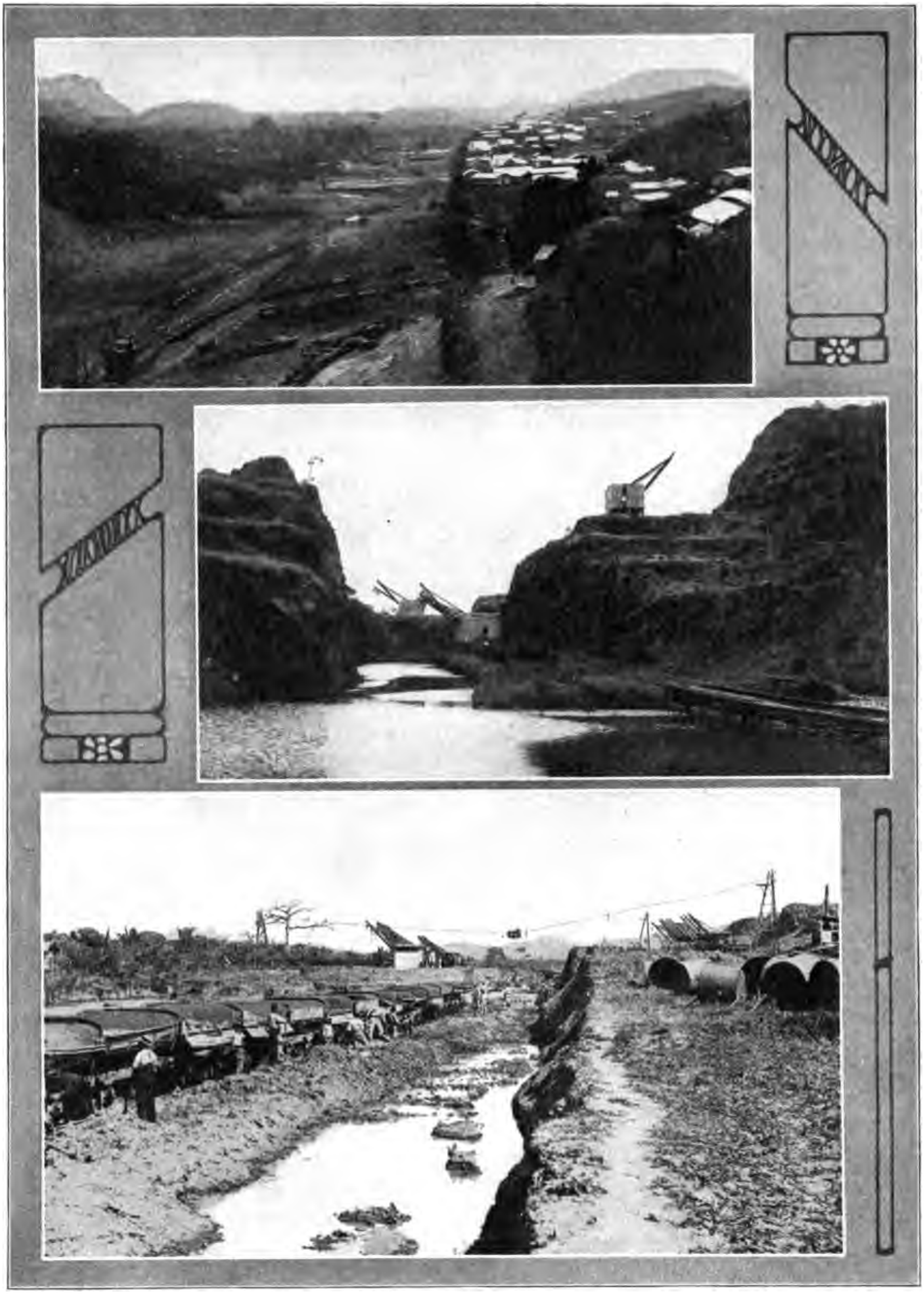
Old French locomotives. One hundred and nineteen of these were rebuilt and used by the Americans.

Meanwhile, as a result of the exposure and investigation of the affairs of the old company, M. De Lesseps and his son Charles were sentenced to five years imprisonment, and similar sentences were imposed upon several others of their associates. The French Court of Appeals annulled the sentence of Charles de Lesseps, and that against his father was never executed for, at that time, January 10, 1893, he was 88 years old and a physical and mental wreck; he died in the month of December, following.

As the Wyse concession had nearly expired, the receiver obtained from Colombia an extension of ten years. It was stipulated that the new company should be formed and work upon the canal resumed on or before February 28, 1893. As this condition was not fulfilled, a second extension of 10 years was obtained, to run not later than October 31, 1894.

THE SECOND OR NEW COMPANY

The Compagnie Nouvelle du Canal de Panama, the New French Canal Company, as it is generally known, was organized under a special law on October 20, 1894, with a capital stock of $13,000,000, with shares valued at $20 each. Six hundred thousand shares were sold for cash, the greater part being taken by the receiver, the contractors, and others, who had been interested in



The top picture shows Bas Obispo in the first French Company's days, at the northern end of their proposed lock. The center picture shows French cranes at work. The French using laborers to fill cars is shown in the lower picture. Cableways, in the distance, were also used for handling spoil.

the old company and escaped criminal prosecution by taking the new stock; and 50,000 shares given to the Colombian Government for the extension of the concession. The new company took possession in 1894, and work was immediately resumed in Culebra Cut with a force large enough to comply with the terms of the concession. As excavation work at this point was necessary under any plans that might be decided upon, it was continued, while elaborate and extensive studies of the Canal project were begun by competent engineers.

The plan finally adopted by the new company involved two levels above the sea, one an artificial lake to be created by a dam across the Chagres River at Bohio, and another a high level canal through Culebra Cut at an elevation of 68.08 feet above mean tide, to be fed by water by a channel leading from a reservoir to be constructed at Alhajuela in the upper Chagres River valley. The lake level was to be reached from the Atlantic by a flight of two locks, and the summit level by a second flight of two locks. On the Pacific side four other locks were provided for, the two middle ones at Pedro Miguel being combined in one flight, and the others being located at Paraiso and Miraflores. On the Atlantic side there was to be a sea level channel to Bohio, 17 miles inland, and on the Pacific side at Miraflores, about 8 miles inland. The depth of the canal was to be 29.5 feet, with a bottom width of 98 feet. The locks were to be in duplicate, 738.22 feet long, 82.02 feet wide, with a normal depth of 29.5 feet. The lifts were to vary from 26 to 33 feet.

A number of old French dredges, which were valueless except as junk, when the United States acquired them.

A second plan was also worked out in which the upper level was omitted, the cut through the divide being deepened to 32 feet above sea level, making the artificial lake created by the dam at Bohio the summit level. Under this plan the feeder from Alhajuela was omitted, although the dam was to be retained to control the Chagres. One flight of locks on the Atlantic side and one lock on the Pacific side were also to be omitted. The estimated cost of completing the canal under this plan was not much greater than the first, and all work on the first plan for several years would be equally available under the second.

Although the first plan was adopted on December 30, 1899, no effort was made to carry it out, on account of the interest being shown by the United States in a canal across Nicaragua. It was realized that if the United States should undertake to construct such a waterway, the work accomplished and the plant on the Isthmus would be practically worthless. In 1895, there was a force of men numbering about 2,000 at work in Culebra Cut, and a year later this was increased to 3,600. This was the largest number of men employed under the new company, for only enough work was done to hold the concession and keep the equipment in a salable condition. The French at that time were beginning to look for a purchaser; they wanted $100,000,000 for the work and equipment, but the only likely buyer was the United States. The Isthmian Canal Commission, appointed by the Spooner Act of 1899, reported in November, 1901, in favor of the Nicaragua route unless the French company was willing to sell out at $40,000,000. This recommendation became a law on June 28, 1902, and the New Panama Canal Company was practically forced to sell for that amount or get nothing.

Although the French on the Isthmus worked under difficulties which eventually forced them to give up the Canal undertaking, they removed with their clumsy side excavators, now obsolete dredges, small Decauville cars and toy Belgium locomotives, a considerable amount of material from the Canal prism, a large part of which has been found useful under the present plan.

The old company excavated 66,743,551 cubic yards, from 1881 to 1889, and the new company excavated 11,403,409 cubic yards up to 1904, a total of 78,146,960 cubic yards; 18,646,000 cubic yards of this total were taken from Culebra Cut, the operation of the new company being practically confined to that portion of the work. Of this total, it has been figured that 29,908,000 cubic yards have been useful to the Americans. The old company dredged a channel from deep water in Panama bay to the wharves at Balboa which has been used by ships docking at that port. On the Atlantic side, the channel dredged inland, known as the French canal, was found useful upon deepening in bringing sand and stone for the locks and spillway concrete at Gatun.

A pile of old French dump cars. Many tons of this scrap material have been collected along the line of the Canal.

The French also turned over valuable surveys and studies of the work, together with plans that have been found of great value to the American organization. The best of this class of work was done under the new company.

This is especially true of the records kept of the flow and floods of the Chagres River, together with rainfall records, so essential to the present plan.

FRENCH AID TO AMERICAN PROJECT

Much of the work of preparation during the first two years of American occupation—1904-1905—would have been seriously delayed without the French supplies and equipment. In the shops and storehouses were found a plentiful supply of repair parts, shop tools, stationary engines, material and supplies of all kinds of good quality. At Gorgona, where the principal shops were located, known during the French times as Bas Matachin shops, were found sheds filled with old locomotives, cranes and excavators. One hundred car loads of foundry and machine shop material were removed from this point. Repair shops were found at Empire, Paraiso, Gatun and Bohio. A small machine shop was uncovered in the jungle at Caimito Mulato, when American engineers were running the center line of the Canal. There was also a dry dock at Cristobal, which was originally 190 feet long, 32 feet wide and 16 feet deep over the sills at ordinary high tide. At Balboa on the Pacific side, there was located a repair and marine shop for the floating equipment. The old French shops in every case formed the nucleus of the larger and better equipped shops maintained by the Americans during the period of construction.

Another view of a part of the old machinery, a legacy from the French. All of the junk along the line of the Canal, both French and American, is being turned into dollars, having been sold to a Chicago wrecking concern.

During the first two years of American occupation, French locomotives were the only ones available by the Isthmian Canal Commission. On June 30, 1906, there were 106 in service, and only 15 American locomotives. The same is true of the French dump cars. In 1904, there were 308 in service, and in 1905, over 2,000 had been repaired and put in commission, as compared with 300 American-built cars. At the present time there are about 100 French locomotives and 200 Decauville dump cars in serviceable condition. In December, 1904, there were six old French excavators working in Culebra Cut, which had been overhauled and placed in service. These were similar to ladder dredges, and the excavation was accomplished by an endless chain of buckets which carried earth and rock from one side and dropped it into a hopper from which it fell into dump cars on the other side. These machines were effective only when working in soft material. They remained at work 18 months before they were replaced by modern steam shovels.

The floating equipment on hand was considerable, and many dredges, clapets or self-propelling hopper barges, tugs, launches, etc., were found in the marine graveyards at Folks River, Cristobal, and in the mouth of the Rio Grande at the Pacific entrance to the Canal, as well as along the banks of the Chagres River. Many of these were floated, rebuilt and placed in commission. On account of the excellent material used in the construction of this equipment, most of which was Scotch-built, the Americans found it highly profitable to repair them. Heavy coats of paint and oil, which 20 or more rainy seasons could not penetrate, had been given the machinery when it was retired, so that when the hulls were not worth repairing, the valuable parts were used elsewhere. Several dredges were reconstructed from parts of others. A Scotch ladder dredge with a capacity of about 130,000 cubic yards per month was repaired at a cost of about $30,000, which, when new, cost about $200,000. At the present time there are several French dredges doing excellent work on the Canal.

A laborer looking for his belongings after a flood. The damage and loss of property caused by the floods during the rainy season is clearly pictured here.

Two thousand, one hundred and forty-nine buildings scattered along the line of the Panama Railroad were included in the turn-over. These were generally small and ill-suited for use, other than as laborers' barracks or storehouses, but it was found profitable to repair some 1,500 of them even after they had stood unused for ten years or more. The large piles of French scrap, old locomotives, boilers, dump cars, parts of machines, etc., which used to be one of the sights along the line of the Panama railroad have slowly disappeared. Much of it has been sold as junk to contractors, while the copper, brass, white metal, rails, and cast iron have been used in the foundry at Gorgona. Old French rails have been used in the reinforcement of concrete in the lock walls, for the repair of dump cars, and for telephone and telegraph poles.

Seven years after the Canal was taken over from the French, May, 1911, the present Isthmian Canal Commission made a careful official estimate of the value to the Commission of the franchises, equipment, material, work done, and property of various kinds for which the United States paid the French Canal Company $40,000,000. It places the total value at over $42,000,000 divided as follows:

Excavation, useful to the Canal, 29,708,000 cubic yards	$25,389,240.00
Panama Railroad Stock	9,644,320.00
Plant and material, used, and sold for scrap	2,112,063.00
Buildings, used	2,054,203.00
Surveys, plans, maps, and records	2,000,000.00
Land	1,000,000.00
Clearings, roads, etc	100,000.00
Ship channel in Panama Bay, four years' use	500,000.00
Total	$42,799,826.00

A mechanical oddity tree grown through an old French dump car.

The AMERICAN TRIUMPH

AN Isthmian Canal Commission organized for the construction of the Canal was appointed under the provisions of An Act of Congress approved June 28, 1902, called the Spooner Act. This Act authorized the President to acquire, in behalf of the United States, at a cost not exceeding $40,000,000, the rights, franchises, property, etc., including the shares of the Panama railroad, owned by the New French Canal Company, and to obtain from the Republic of Colombia perpetual control of the necessary strip of land across the Isthmus, which control should also include the right to perpetually maintain and operate the Panama railroad, and jurisdiction over the ports at either end.

If the President should be unable to obtain a satisfactory title to the property, and the control of the necessary territory, within a reasonable time and upon reasonable terms, then the Commission was authorized to construct a waterway across Nicaragua, using Lake Nicaragua and the San Juan River, after the President had first obtained perpetual control, by treaty with Costa Rica and Nicaragua. The impossibility of the United States to come to a satisfactory agreement with Colombia, who thought that the United States was now committed to construct a canal across Panama and, therefore, could be made to pay a larger amount than first offered, led to the revolution of November 3, 1903, by which Panama, a state of Colombia became the Republic of Panama, and the signing of a treaty by the new Republic by which the United States was granted in perpetuity the necessary territory. This strip of land, known as the Canal Zone, containing about 436 square miles, extends from deep water in the Atlantic to deep water in the Pacific (three miles from the low water mark on either side), and five miles on either side of the center line of the canal. Included in this grant are the Islands of Naos, Perico, Flamenco and Culebra in the Bay of Panama, which are now connected with the mainland by a breakwater, and upon which fortifications are being placed. The cities of Panama and Colon are excluded from the limits of the Canal Zone, but the United States exercises sanitary control over them, and also has the right to maintain public order in them in case the Republic of Panama should not be able in the judgment of the United States to do so.

MEMBERS OF THE ISTHMIAN CANAL COMMISSION.

COL. GEO. W. GOETHALS, U. S. A.,
Chairman and Chief Engineer.

COL. WILLIAM C. GORGAS, U. S. A.,
Chief Sanitary Officer.

COL. HARRY F. HODGES, U. S. A.,
Assistant Chief Engineer.

H. H. ROUSSEAU, CIVIL ENGINEER, U. S. NAVY,
Assistant to the Chief Engineer.

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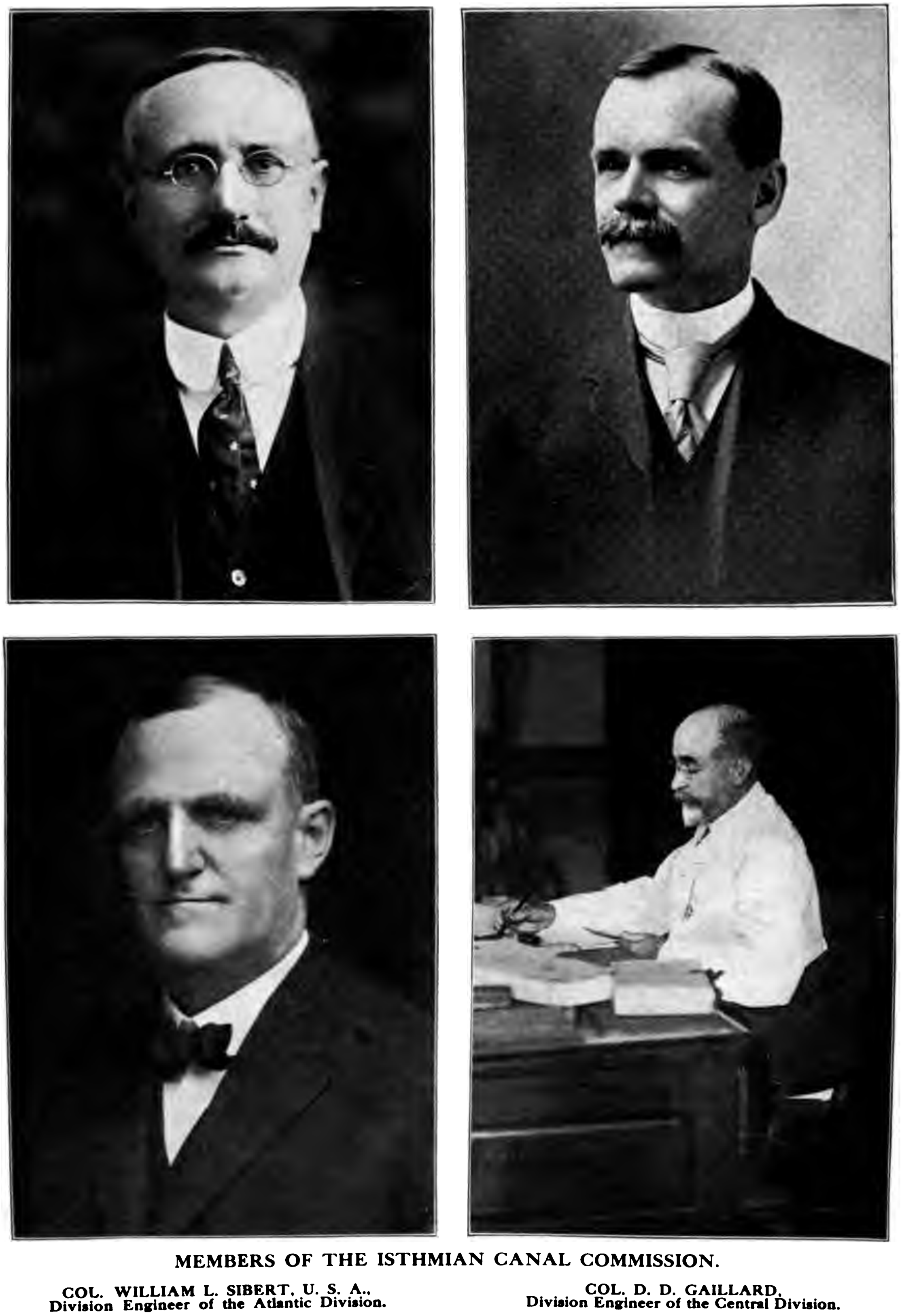

MEMBERS OF THE ISTHMIAN CANAL COMMISSION.

COL. WILLIAM L. SIBERT, U. S. A.,
Division Engineer of the Atlantic Division.

COL. D. D. GAILLARD,
Division Engineer of the Central Division.

HON. RICHARD LEE METCALFE,
Head of Department of Civil Administration.

JOSEPH BUCKLIN BISHOP,
Secretary.

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As compensation to the Republic of Panama, the United States paid $10,000,000, and agreed to make an annual payment of $250,000, to begin nine years after the date of the treaty. These annual payments commenced in February, 1913.

ORGANIZATION OF THE CANAL COMMISSION

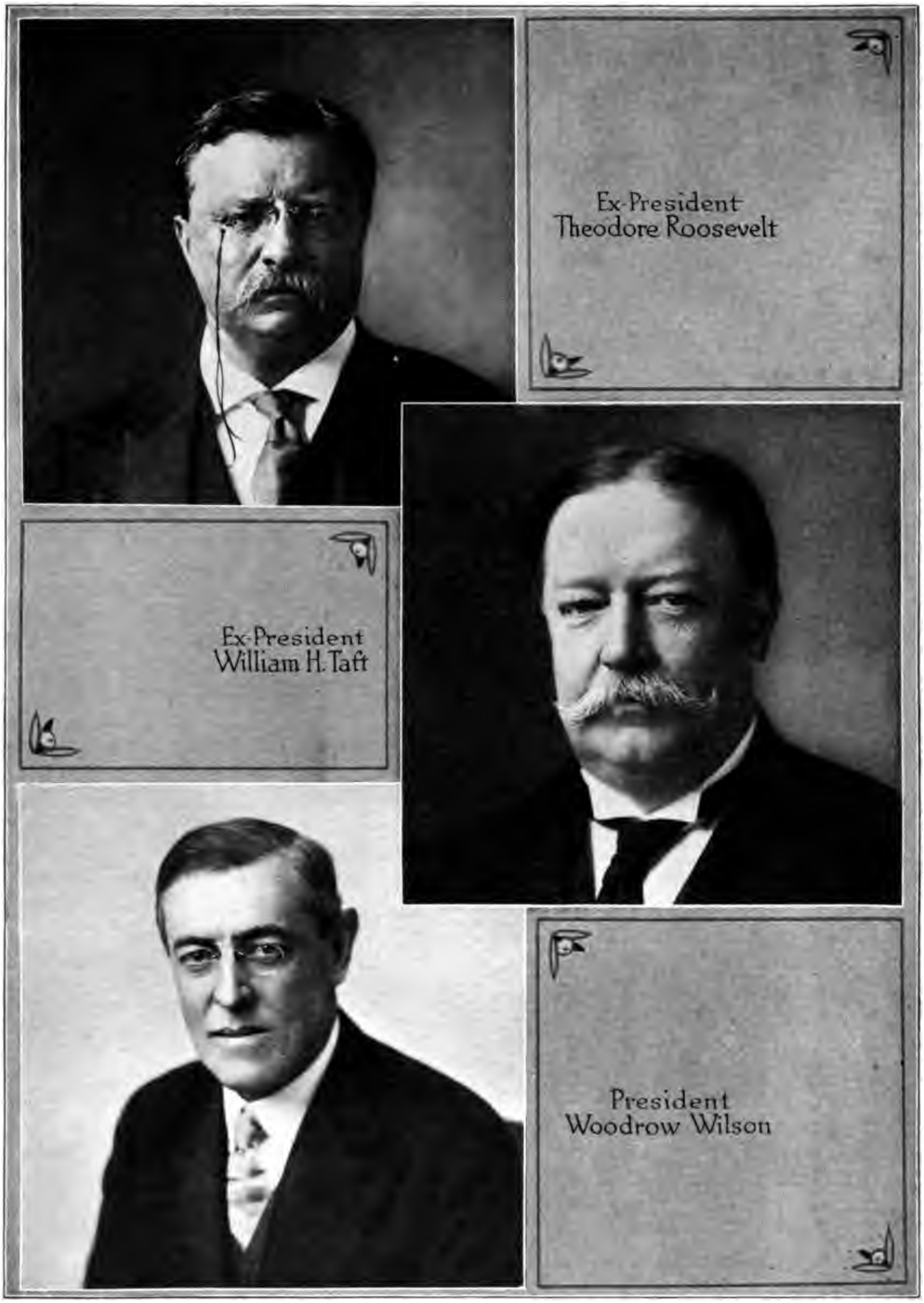
The first meeting of the Isthmian Canal Commission was held in Washington, D. C., on March 22, 1904, with the following members appointed by the President: Rear-Admiral John G. Walker, Chairman; Major-General George W. Davis, U. S. A., William Barclay Parsons, C. E., William H. Burr, C. E., Benjamin H. Harrod, C. E., Ewald Grunsky, C. E., and Frank J. Hecker. On May 9, 1904 Ex-President Roosevelt, by Executive Order, placed the immediate supervision of its work, both in the construction of the canal and in the exercise of such governmental powers deemed necessary under the treaty with Panama in the Canal Zone, in the hands of the Secretary of War, William H. Taft.

The full Commission first arrived on the Isthmus on April 5, and established temporary headquarters in the old De Lesseps residence in Cristobal. A thorough study was made of the plans and methods of work as carried on by the French, in which work it was assisted by Maj. William M. Black and Lieutenant Mark Brooke, U. S. Corps of Engineers, and by M. Renaudin, the resident representative of the New Panama Canal Company. From this examination it was found that new and extended surveys would be necessary before any of the problems of location and construction could be settled, so the first step of the Commission on its return to the United States on April 29, was the organization of engineering parties. Five of these were organized, the first leaving for the Isthmus about the middle of May, and the others shortly after. Surveys and investigations were made by these parties of the proposed harbor improvements of Colon, the proposed dams for the control of the Chagres River at Gatun, Bohio and Gamboa, and the design of water works and sewers for the cities of Colon and Panama.

TAKING POSSESSION—CHANGE IN CHIEF ENGINEER

The United States represented by Lieutenant Brooke, U. S. A., took possession of the French canal property on May 4, 1904, and operations were continued with the same employes and laborers, about 700, that had been left by the French company, for work had been continuous in Culebra Cut from the beginning in 1881, except for a few years, in order to hold the franchise. Although neither the equipment nor the organization of this force was adequate, it was considered advisable to maintain it for the time being and to gradually introduce necessary changes in the organization and in the equipment.

Lieutenant Brooke remained in charge of this work until the arrival of Major-General Davis, who was appointed Governor of the Isthmus on May 8, 1904, and arrived on May 17. On the day of his arrival it was announced to the inhabitants of the Canal Zone that the territory had been occupied by the United States of America. This was a little bit too precipitate for the Panamanians who had been accustomed under the French regimé to much speech-making, feasting, and champagne drinking when any undertaking was put into operation, so they protested to the State Department, to the end that, to their minds, more fitting ceremonies were later indulged in. Governor Davis was also placed in temporary charge of the construction work until the Chief



The chroniclers of history for all time will associate the names of Roosevelt, Taft and Wilson with the world's greatest undertaking,—the construction of the Panama Canal. Students of the subject will doubtless concede that to Theodore Roosevelt should be accorded the distinction of inaugurating the enterprise, to his successor, former President Taft should belong the honor of four years of faithful service in carrying forward the stupendous work so encouragingly begun, and to President Woodrow Wilson falls the duty of installing the splendid success which the resources, perseverance and indomitable courage of American citizenship have rendered possible.

Engineer, Mr. John F. Wallace, entered upon his duties on June 1, 1904. Mr. Wallace resigned as Chief Engineer on June 25, 1905, after serving one year, and was succeeded by Mr. John F. Stevens on July 20, 1905.

Mr. Wallace, who had become dissatisfied with the working methods of the first Commission was made a member of the Commission under an Executive Order dated April 1, 1905, which reorganized it, and gave to him full control in the department of construction and engineering. This reorganization was brought about by the Secretary of War who, by direction of the President in March, 1905, requested the resignations of the commissioners, which were at once tendered. It was believed that this change would make a more effective force for doing the required work, and do away with the long delays occasioned in purchasing material and supplies and in the accomplishment of work by government "red tape" which had become so irksome to Mr. Wallace. His resignation shortly after this change, six days after his return to the Isthmus from Washington, was hard to understand, but it is possible that the question of health entered considerably into his decision, for it was at this time that the first outbreak of yellow fever among the Americans had occurred and the first victim was Mrs. Frank Seager, the wife of Mr. Wallace's private secretary.

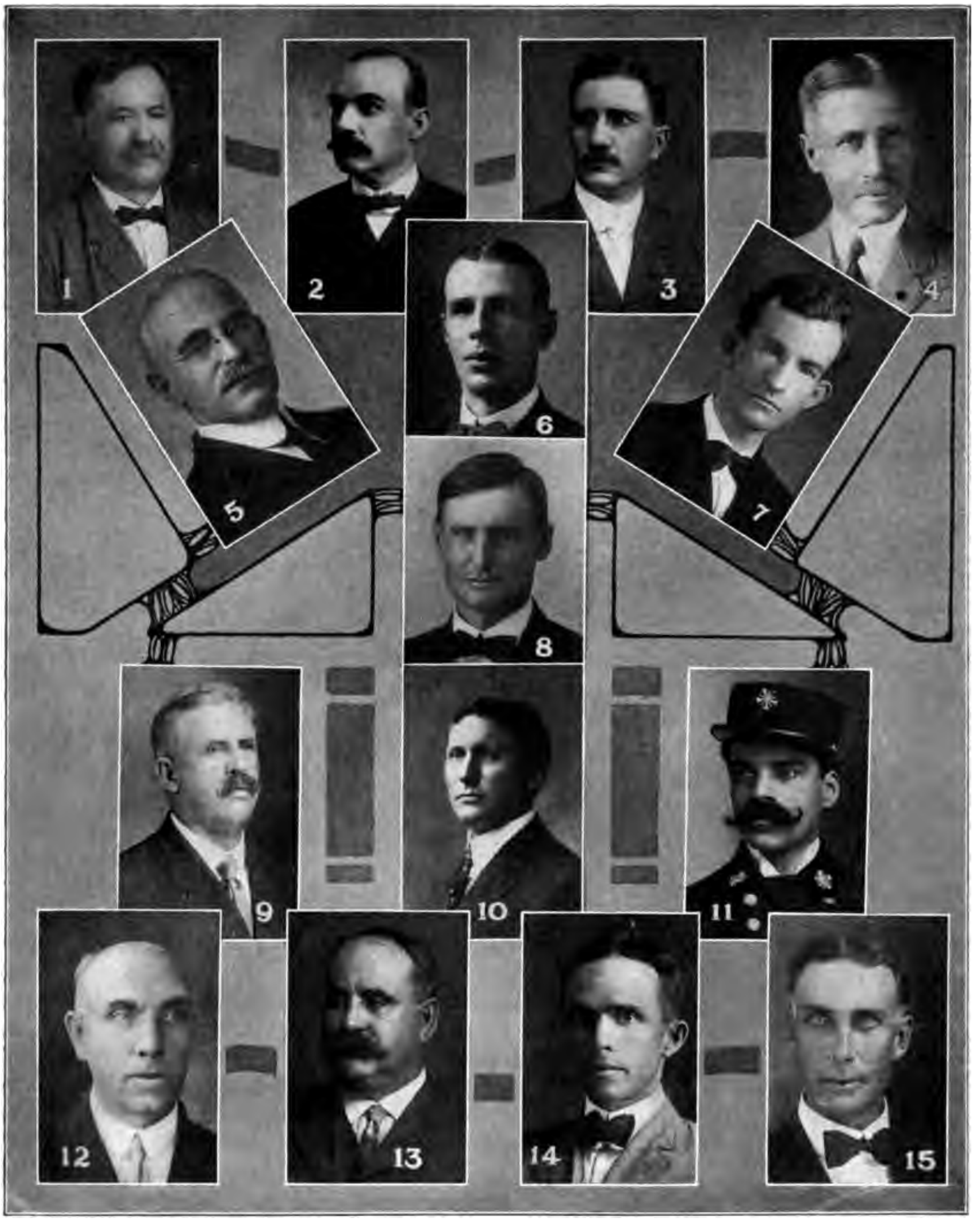
THE NEW COMMISSION

The new Commission created under the above mentioned Order consisted of the same number of members, seven, but full power was practically vested in three members who were placed in charge of the three executive departments created. One department was under the direction of the Chairman of the Commission, Theodore P. Shonts, and took charge of the fiscal affairs, the purchase and delivery of material and supplies, the accounts, bookkeeping, and audits, and the commercial operations in the United States of the Panama railroad and steamship lines, with headquarters in Washington; another, under the Governor of the Zone, Charles E. Magoon, which looked after the administration and enforcement of law in the Zone, the sanitation of the Canal Zone and the cities of Panama and Colon, and the custody of all supplies and construction necessary for sanitary purposes, and the third, under the Chief Engineer, John F. Wallace, which had charge of the work of construction, the custody of all supplies and plant on the Isthmus and the practical operation of the railroad on the Isthmus with special view to its utilization in the Canal construction work.

An executive committee of not less than three members, a majority of whom constituted a quorum was also created to act in place of the full commission, which had heretofore only met quarterly, during the intervals between meetings, in order to secure the uninterrupted course of the work. This executive committee met twice a week in the office of the Governor on the Isthmus until it was abolished on November 17, 1906.

The new department of Government and Sanitation was placed in charge of Mr. Charles E. Magoon, as a member of the Commission, vice Major-General Geo. W. Davis, who returned to the United States on May 9, 1905, in accordance with instructions received from the Secretary of War, on account of failing health. When General Davis left the Isthmus he turned the work over to Col. W. C. Gorgas, the Chief Sanitary Officer, who acted as Governor until May 25, when Governor Magoon assumed the duties of his office.

The new Commission now consisted of seven members, as follows: Chair-



SOME OF THE MEN ON THE BIG JOB.

(1.) Hezekiah A. Gudger, Chief Justice of the Canal Zone Supreme Court. (2.) Frank Feuille, Counsel and Chief Attorney of the Isthmian Canal Commission and the Panama Railroad. (3.) H. A. A. Smith, Examiner of Accounts. (4.) A. S. Zinn, Resident Engineer in the Central Division, who has been identified with the work in Culebra Cut since 1906. (5.) Henry Goldmark, designing engineer, in charge of the lock gates of the Canal. (6.) T. B. Monniche, designing engineer, in charge of the emergency dams of the locks. (7.) John H. McLean, Disbursing Officer of the Isthmian Canal Commission. (8.) Capt. Robert E. Wood, U. S. A., Chief Quartermaster of the Isthmian Canal Commission. (9.) W. G. Comber, Resident Engineer of the Sixth (Dredging) Division. (10.) Capt. Charles W. Barber, Chief of Canal Zone Police. (11.) C. E. Weidman, Chief of the Fire Department. (12.) Tom M. Cooke, Chief, Division of Posts, Customs, and Revenues. (13.) Lieut. Col. Eugene T. Wilson, Subsistence Officer. (14.) George M. Wells, Resident Engineer, Department of Municipal Engineering. (15.) Harry O. Cole, Resident Engineer, Fifth Division.

man, Theodore P. Shonts, Charles E. Magoon, also Governor of the Canal Zone, Rear-Admiral Mordecai T. Endicott, Brigadier-General Peter C. Hains, U. S. A. (retired), Col. Oswald H. Ernst, U. S. A., Benjamin M. Harrod, and John F. Wallace, also Chief Engineer.

COMMISSION AGAIN REORGANIZED

On November 17, 1906, the commission was again reorganized by Executive Order in order to promote harmony and to secure results by more direct methods and a centralization of power. In order to do this, the following departments were created under the new organization: Chairman, Chief Engineer, General Counsel, who took over the duties of the Governor, Chief Sanitary Officer, General Purchasing Officer, General Auditor, Disbursing Officer, and Manager of Labor and Quarters.

On September 25, 1906, Gov. Charles E. Magoon, was transferred to administer affairs in Cuba, and was succeeded by Richard Reid Rogers the General Counsel in Washington on November 19, 1906. While Mr. Rogers was in Washington, Mr. H. D. Reed acted as head of the department on the Isthmus until the arrival of Mr. Jo. C. S. Blackburn who was appointed as Head of the Department of Civil Administration on April 1, 1907. On April 2, 1907, the authority of the Governor, or Chief Executive of the Canal Zone, was transferred by order of the Secretary of War to the Chairman's office, so from that time the Chairman and Chief Engineer has in reality been Governor of the Canal Zone also.

Mr. Shonts resigned effective March 4, 1907, and the resignation of General Hains, Major Harrod, and Rear-Admiral Endicott, were accepted on March 16, 1907. Finally, Mr. Stevens resigned effective April 1, 1907. The resignation of Mr. Stevens was as great a surprise as that of Mr. Wallace. According to the report current at the time, the chief engineer became alarmed over the possibility of awarding the contract for the construction of the canal to the Oliver-Bangs combination, and wrote a letter to the President, setting forth that the canal organization had been pretty well perfected; that more dirt had been taken out during the previous 30 days than had ever been taken out before in the same length of time; that he did not care to share the work of building the canal with anyone, nor be hampered with men less familiar with the subject than himself. He intimated that if his wishes were not complied with he would quit. The letter is said to have caused ex-President Roosevelt something of a shock, but with his characteristic spontaneity of action, he cabled acceptance of the "resignation."

In order to get competent men who were used to working under Government regulations and orders, and who would "stick," ex-President Roosevelt resorted to the Army, with the result that three officers of the Corps of Engineers, U. S. A., the Chief of the Bureau of Yards and Docks, U. S. N., an officer of the Medical Corps, U. S. A., and two civilians were appointed in their places, thus practically abandoning the plan of carrying on the work under civilian direction. Under this new organization a combination of the positions of Chairman and Chief Engineer was effected, and the creation of the Department of Sanitation, distinct from Civil Administration was made. It was also required that the commissioners take their station on the Isthmus and thus be in direct touch

A feature of the Fourth of July celebration at Cristobal, in 1911, when Colonel Goethals delivered an address. A flag chorus of school children is seated back of him. The Fourth has been religiously observed by the Americans on the Isthmus every year since 1904.

with the work under their charge. This new commission assumed its duties on April 1, 1907, and consisted of the following:

Col. Geo. W. Goethals, U. S. A., Chairman and Chief Engineer; Col. D. D. Gaillard, U. S. A., Head of Department of Excavation and Dredging; Lieut.-Col. Wm. L. Sibert, U. S. A., Head of Department of Lock and Dam Construction; Col. W. C. Gorgas, U. S. A., Chief Sanitary Officer; Civil Engineer H. H. Rousseau, U. S. N., Head of Department of Municipal Engineering, Motive Power and Machinery and Building Construction; Jackson Smith, Manager, Labor, Quarters and Subsistence; Jo. C. S. Blackburn, Head of Department of Civil Administration; Joseph Bucklin Bishop, Secretary.

The personnel of the above commission has remained unchanged with three exceptions. Jackson Smith resigned on September 15, 1908, and the department of labor and quarters is now a part of the Quartermaster's Department under direction of Captain R. E. Wood, U. S. A., and the Subsistence Department under direction of Major Eugene T. Wilson, U. S. A., as a separate department. Mr. Jo. C. S. Blackburn resigned, effective December 4, 1909, and was succeeded on May 13, 1910, by Mr. Maurice H. Thatcher, Mr. Rousseau acting as Head of the Department during the interval. Mr. Thatcher resigned, effective on June 14, 1913, and was succeeded by Mr. Richard L. Metcalfe, the present head of the department.

John F. Wallace, first Chief Engineer of the Panama Canal. He entered upon his duties June 1, 1904, and resigned June 25, 1905.

John F. Stevens, second Chief Engineer. He was appointed July 20, 1905, and resigned April 1, 1907, Col. Geo. W. Goethals, taking his place.

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The Departments of Excavation and Dredging and Lock and Dam Construction were abolished and, on July 1, 1908, became the Atlantic Division, under Colonel Sibert, having charge of the dredging operations in the Atlantic entrance, and the lock, dam and spillway work at Gatun, and the General Division, under Colonel D. D. Gaillard, which has charge of the excavation in the Culebra Cut section. On July 15, 1908, the Pacific Division was organized and charged with the lock, dam and spillway work at Pedro Miguel and Miraflores, and the dredging work in the Pacific entrance under Mr. S. B. Williamson, Division Engineer. Upon the resignation of Mr. Williamson on December

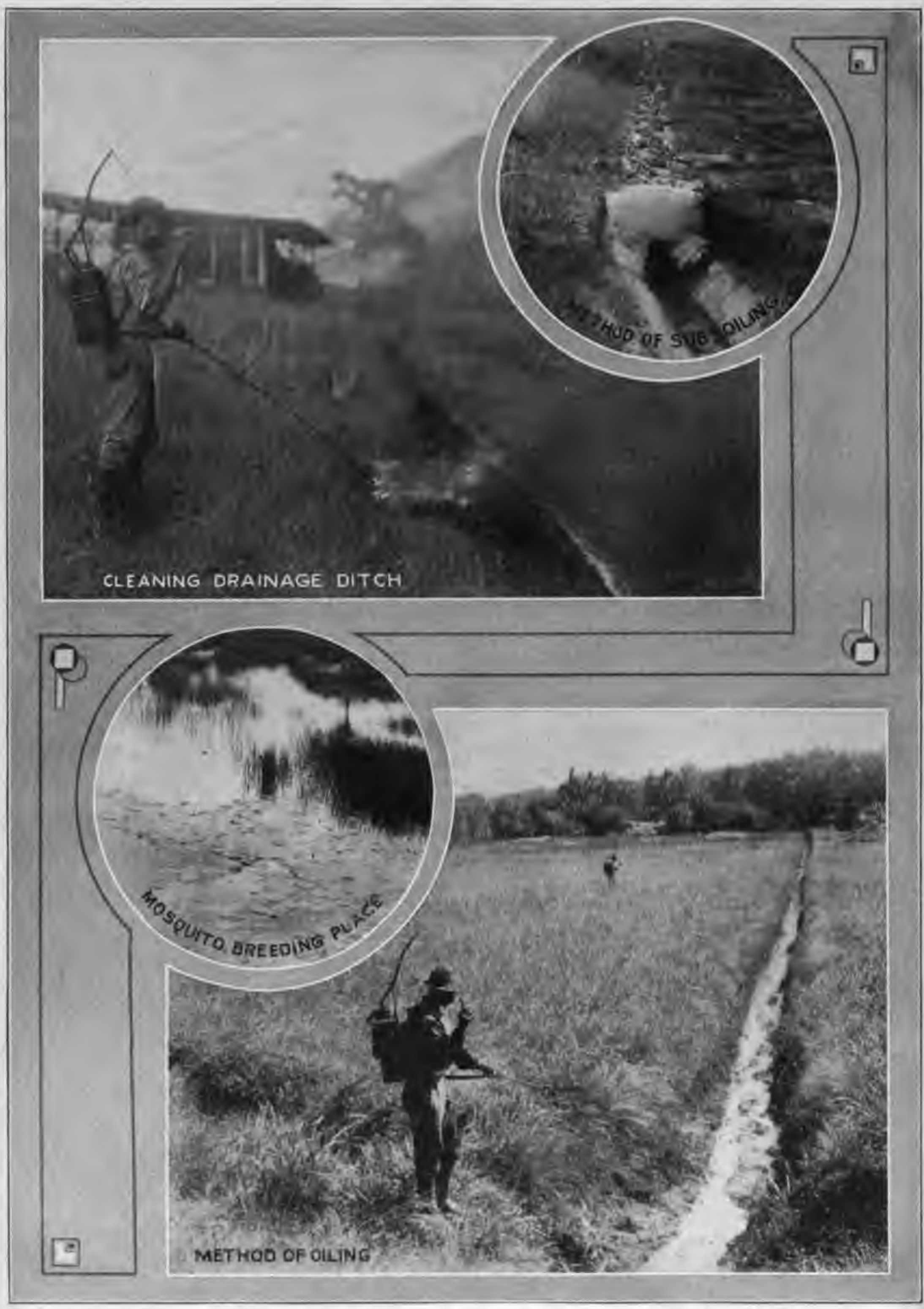
12, 1912, the Pacific Division was abolished and its work was placed under the immediate charge of the Chief Engineer, as the Fifth Division of the Department of Construction and Engineering. On May 1, 1913, the dredging work of the Atlantic and Pacific Divisions was consolidated under Mr. W. G. Comber, Resident Engineer, forming the sixth Division of the Chief Engineer's office. The Department of Municipal Engineering, Motive Power and Machinery, and Building Construction, was abolished on August 1, 1908, and became a part of the Department of Construction and Engineering with Mr. Rousseau, Assistant to the Chief Engineer in charge. The present commission consists of the following members:

Colonel Geo. W. Goethals, U. S. A., Chairman and Chief Engineer; Colonel H. F. Hodges, U. S. A., Assistant Chief Engineer (Appointed July 14, 1908, vice Jackson Smith); Civil Engineer H. H. Rousseau, U. S. N., Assistant to the Chief Engineer; Colonel D. D. Gaillard, U. S. A., Division Engineer, Central Division; Lieutenant-Col. Wm. L. Sibert, U. S. A., Division Engineer, Atlantic Division; Colonel W. C. Gorgas, U. S. A., Chief Sanitary Officer; Richard L. Metcalfe, Head of Department of Civil Administration; Joseph Bucklin Bishop, Secretary.

Of these eight men, Colonel Gorgas is the only one who has been in the service since the inauguration of the work. Colonel Gaillard left the Isthmus on August 9, 1913, on special leave of absence, suffering from a nervous breakdown, due to his long service on the Isthmus, and it is probable that he will not return.

THE PURCHASING END

The Commission maintains an office in Washington in charge of Major F. C. Boggs, U. S. A., who fills the positions of Chief of Office, and General Purchasing Officer. The work is apportioned among the following divisions: General Office, Disbursing Office, Office of Assistant Examiner of Accounts, Appointment Division, Correspondence and Record Division, and Purchasing Department. The Appointment Division has to do with filling requisitions for American employes, and during the fiscal year ending June 30, 1913, 2,065 persons were tendered employment on the Isthmus in grades above that of laborer. Of this number, 1,183 accepted and were appointed, covering 59 different positions. The purchasing branch was organized on August 15, 1907, and placed under the supervision of the Chief of Engineers, U. S. A., with an officer of the Corps of Engineers in charge. Additional offices for the purchase of materials are maintained at New York, New Orleans, and San Francisco. Medical and hospital supplies are purchased through the Medical Supply Depot of the Army in New York. Nearly all supplies are purchased under contract by means of advertising for bids and making awards thereon, and all material is carefully inspected before shipment, although the right is reserved of making final inspection on the Isthmus. As an illustration of the work of this department, a total of 7,087 orders were placed during the last fiscal year to the value of $12,335,973.12.



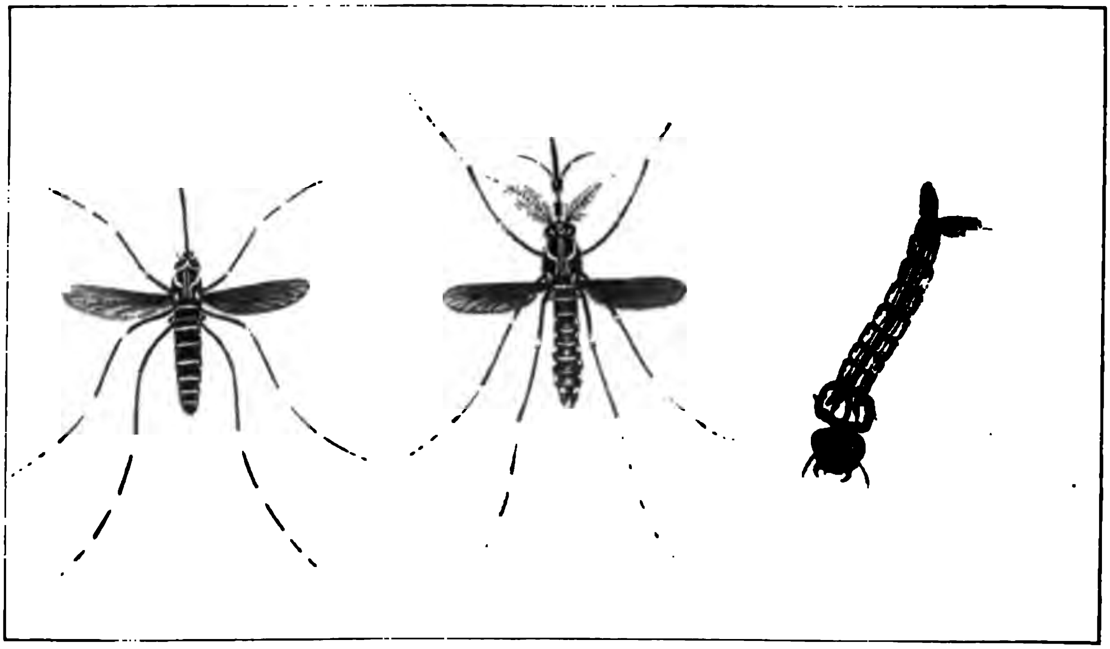
Every square foot of swamp was a breeding place for mosquitoes. Draining swamps, subsoiling and burning grass, are some of the methods used in the prevention of mosquito breeding. The man in the upper picture is shown burning grass which grows along the open ditches and drains. In the lower picture he is shown spraying larvacide on the grass.

they would undergo the experiment only on condition that they should receive no reward for such service. They both contracted the fever and recovered; Moran is now in the employ of the Commission on the Isthmus. After extensive experiments, the mosquito transmission theory came to be fully accepted by experts on tropic diseases.

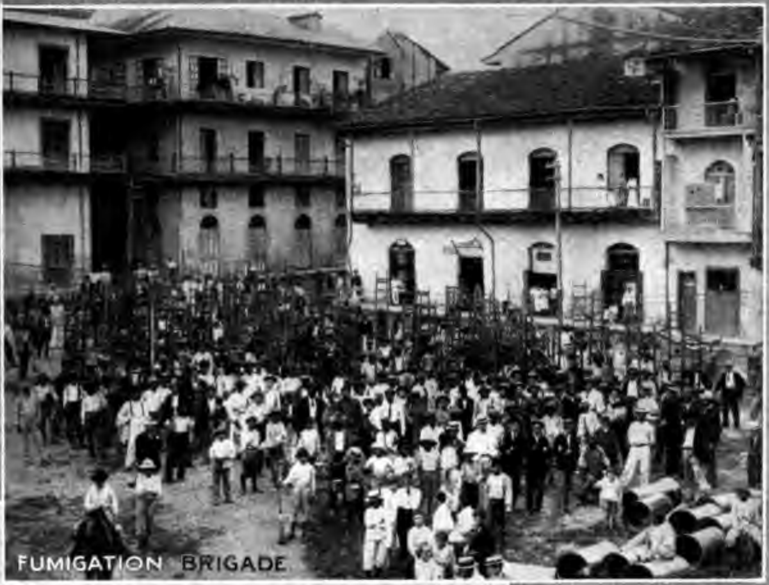
By this knowledge the work on the Isthmus was greatly simplified. The prophylactic method of fighting yellow fever and reducing malaria was found to be in the extermination of the mosquito as far as possible, and screening dwellings against them. As soon as wire netting could be brought to the Isthmus all buildings in the Canal Zone were properly screened. The destructive methods consist in the draining of low places, removal of vegetation, in the damp shade of which mosquitoes breed, and the killing of larvae by oiling pools and streams that could not be drained.

A mosquito disguise, which took first prize in the masquerade contest in Panama Carnival of 1904.

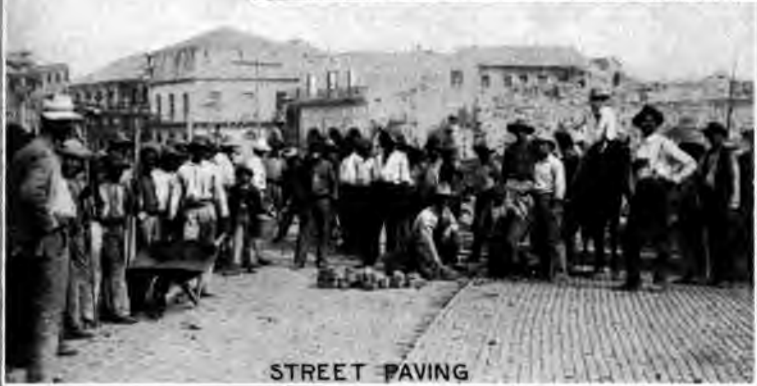
At the outset, Colonel Gorgas was hampered by the failure of the Commission in Washington to realize the immediate necessity for large expenditures



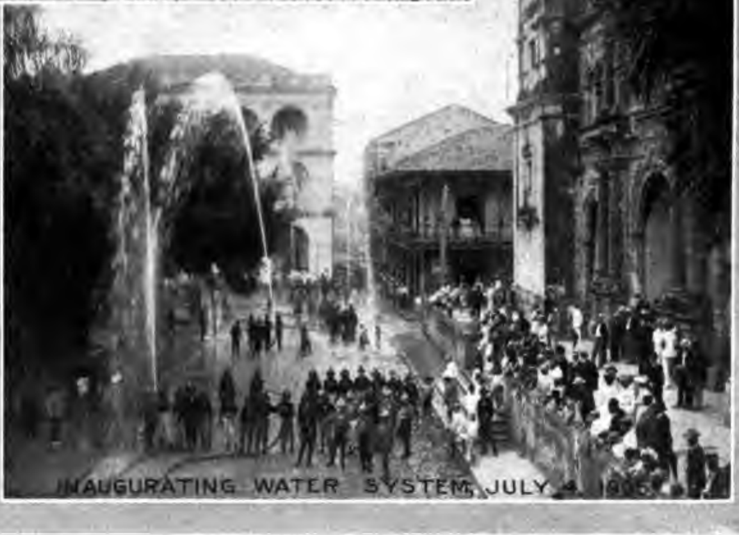
The genus Stegomyia mosquito, male and female. The female on the left, the **male in the center and the larva on the right.** The species has distinctive markings, and the **harp-shaped design near the head is found on no other mosquito.** The male does not bite, and **is, therefore, harmless; it is the female that causes all the trouble.**



FUMIGATION BRIGADE



STREET PAVING



INAUGURATING WATER SYSTEM, JULY 4, 1905

It took months of labor, and sortie after sortie, before the mosquito horde began to thin. A gang of about 900 natives was at one time engaged with ladders and paste, sealing all the crevices in the houses in Panama, prior to fumigation. Streets were paved, a water system installed, and a general clean-up was made.

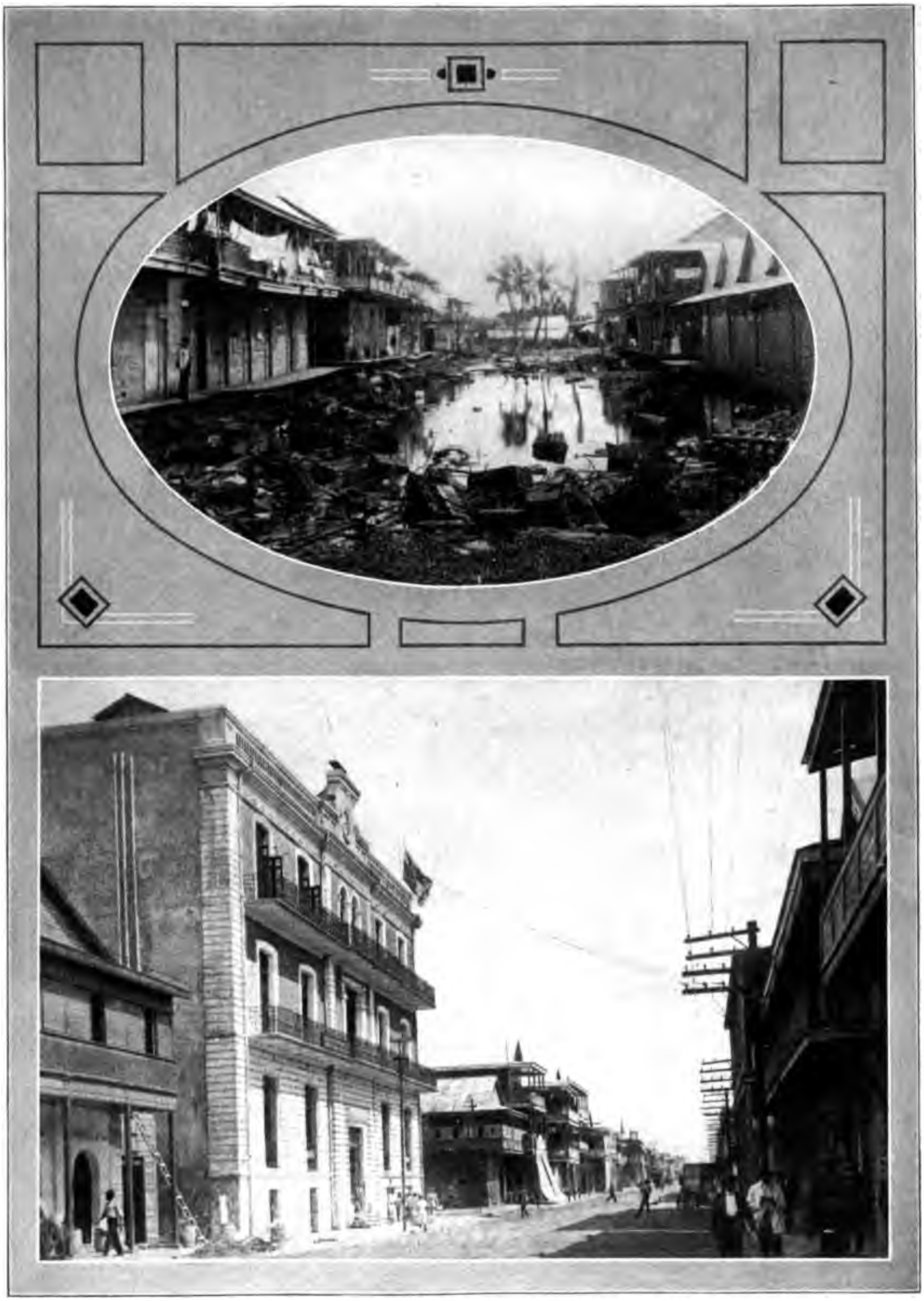
The quarantine station on Culebra Island in Panama Bay. Owing to the fact that the Isthmus is hemmed in on both sides, by plague-infected ports, the most rigid precautions are observed, and steamers from these ports are held in quarantine, unless they have been seven days at sea.

for the purpose of exterminating the mosquito. This was later remedied, and the purse strings were loosened. An outbreak of yellow fever among the recently unacclimated Americans began in December, 1904, and lasted until December, 1905. During the epidemic there were in all 246 cases and 34 deaths. Of this number, 134 of the cases and all of the deaths were among canal employes. The constantly increasing headway made by the disease in the early months of 1905 caused a panic among the employes. A great many of them left the Isthmus as soon as they could obtain accommodations on the overcrowded steamships. This was an object lesson, and resulted in a partial suspension of actual canal construction work until the eradication of yellow fever was effected. In addition to a rigid quarantine, a relentless fight was waged against the mosquito, with the result that the last case of yellow fever occurred in May, 1906, two years after the work started.

THE FIGHT ON THE MOSQUITO

When a case of yellow fever was reported or found by one of the corps of

Colon Hospital, on the Atlantic side of the Isthmus. It stands on the sea beach, and some of the wards are built over the water.

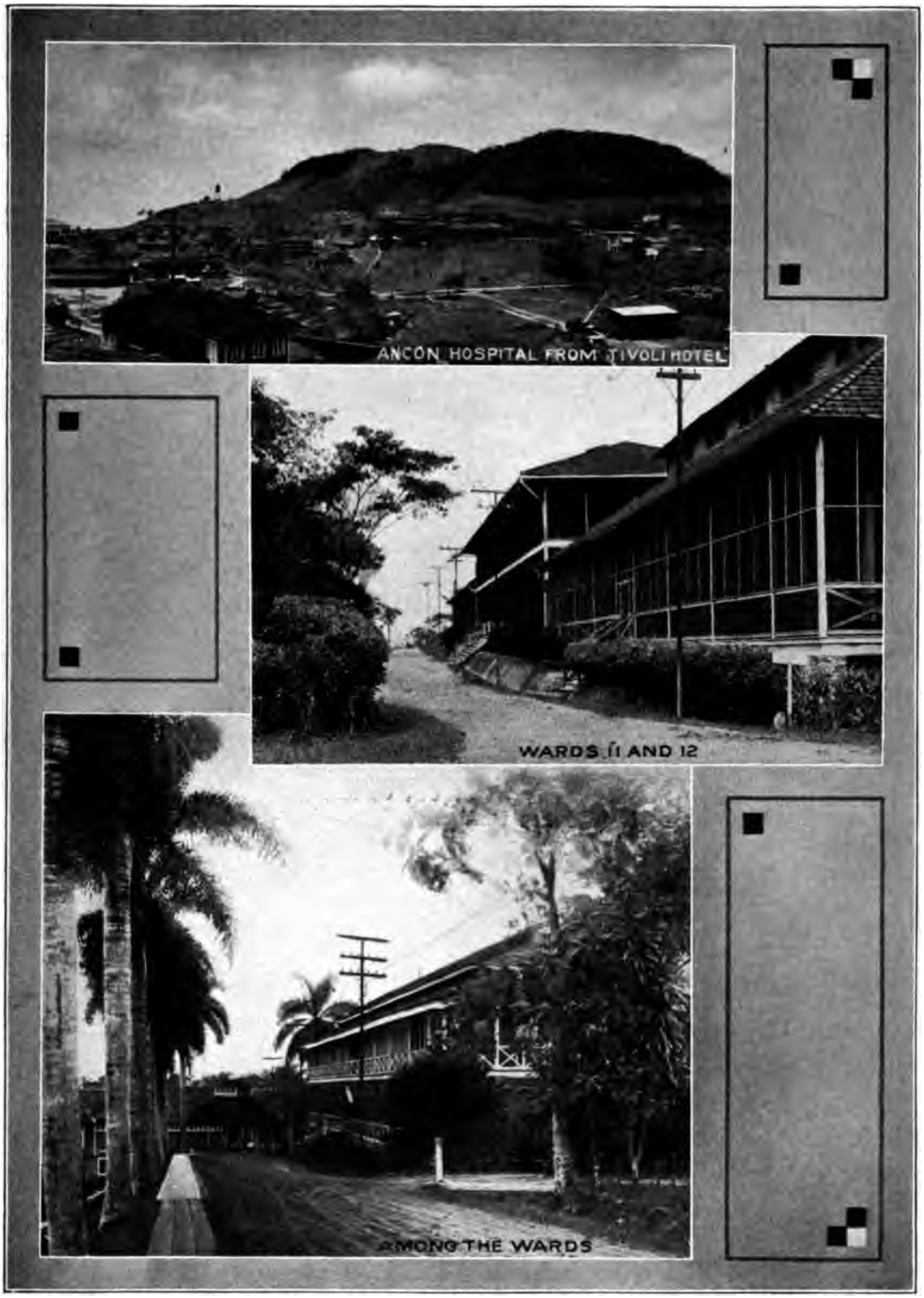


The above comparison of—before and after paving—is not exaggerated. When the Americans took charge of the work many of the streets in Colon and Panama City were veritable bogs in the rainy season. Now, both cities compare favorably in clean, well paved streets, with others of their size.

inspectors in the course of a house-to-house search for cases, the patient was immediately taken to the hospital and placed in a room protected by screening. The next step was the thorough fumigation of the house from which the patient had been removed, in order to kill any infected mosquitoes that might remain. Finally an endeavor was made to locate and fumigate the source of infection. When the epidemic of 1905 was at its height, the plan of fumigating every house in the cities of Panama and Colon, whether or not there had been cases of yellow fever in them, was carried out. The native residents at first submitted to the fumigation with poor grace, as they are immune and could not see the necessity for it. Later, they became more reconciled, but complaints were numerous. There is now pending in Congress a claim for $50,000 to cover damages due to a fire in the Malambo district of Panama in the spring of 1905, which is claimed to have been started by the overturning of a fumigating oven.

The Dispensary at Ancon. Dispensaries and Field Hospitals are maintained at all the important Canal Zone settlements for first aid treatment.

The fight against the *Anopheles*, the malaria-carrying mosquito, has been continuous, for it is next to impossible to eliminate it entirely. This species, unlike the *Stegomyia*, is strong on the wing and is, therefore, able to enter the cities and villages after breeding in the swamps and stagnant pools in the outskirts. To counteract this as much as possible, miles of drainage ditches have been constructed in the vicinity of the canal towns; small streams are kept cleaned out to facilitate the flow of water; swamps have been filled in and grass and rank vegetation kept cut. Regulations are also enforced against allowing



The Government operates two main hospitals. One at Ancon and the other at Colon. The Ancon Hospital is the larger and best equipped, with a reputation in the Tropics second to none. It was begun by the French in 1883, but many improvements have been made by the Americans.

There are 47 wards in the Ancon Hospital, and this is the interior of one of them. The white American employes, European laborers and the negroes, are cared for in separate wards. There are private wards also, and one for charity cases. The Canal Commission furnishes free medical treatment to all of its employes.

any water receptacles, like tin cans, etc., being thrown into the bush where they might fill during a rainstorm and make ideal breeding places for the mosquito larvae. Such possible breeding places as cannot be eliminated by draining and filling are sprayed with a form of oil, called larvaecide, which destroys the mosquito larvae as they come to the surface of the water to breathe. In spite of all these efforts there are many cases of malaria, but the number has been rapidly reduced, and the type of disease has been reduced from a virulent to a comparatively mild type. While the mortality from malaria was never so high as other forms of tropic disease, Colonel Gorgas always considered it one of the most important on account of the heavy sick rate. Medicinally, the disease is treated by quinine, many thousands of pounds of which have been used in the hospitals and issued from the dispensaries maintained in each canal zone village.

CLEANING HOUSE

While a war of extermination was being waged against the mosquito, it was also absolutely necessary to clean house, especially in the cities of Panama and Colon. The latter place, the site of which was partly a tidal swamp, had to be filled in. Proper sewer systems were installed in both cities, where none existed before, unless the open drains in the streets, filled with refuse and other filth, could be called sewers. Suitable water systems also had to be introduced, for up to July 4, 1905, the supply of water was drawn from the cisterns which were allowed to fill during the rainy seasons, or from wells, and afterward peddled from door to door by the *aguadores* or water cartmen. When the water was turned on, all cisterns were closed. Likewise the streets which became virtually mud holes in the rainy season were properly paved with brick or graded. A method of garbage disposal was also provided, for up to this time buzzards were the only scavengers. Now, the streets are kept swept and the garbage is collected every night from especially designed containers which every householder is supposed to have. It is then transported to low swampy places in the outskirts of the cities where it is burned, the ashes being used as a fill. In the Canal Zone, garbage is usually destroyed at incinerating plants. In Panama and Colon the collection is made by the health department of the Canal Commission. All the street, sewer and water improvements in these cities done by the engineering department of the Canal Commission will be paid for by the Republic of Panama from its water rates, on the amortization plan. The money advanced by the United States, about $3,500,000, is to be repaid in 50 years from July 1, 1907, but at the present rate of payment, settlement will have been made much sooner.

The villages in the Canal Zone along the line of the Canal were not so filthy as Panama and Colon, but were without sewer and water systems. Since then several reservoirs have been constructed, and all houses are connected with sewer systems. Macadam roads have gradually replaced trails; garbage is collected daily and properly disposed of; grass and other tropic vegetation is kept cut down in the vicinity of dwellings, and well-kept gardens and hedges make the construction villages appear like model towns. Strict sanitary regulations are enforced in all the Canal Zone towns, as well as in the cities of Panama and Colon, and each place has its sanitary inspectors, or inspector.

RESULTS HAVE JUSTIFIED THE COST

With cleanliness alone, however, the high sick and death rate could not be materially reduced. The successful war on the mosquito, which was started

Along the coast a few miles from Panama City, is a Leper colony of 24 persons, called Palo Seco. This is the colony house and surroundings. The lepers are well treated, and have all the creature comforts furnished free by the Government, and spend a part of their time growing vegetables for their own consumption.

by Colonel Gorgas when the engineers were busy constructing water works and sewers, has freed the Isthmus of its reputation as a pest hole, and has made its sick and mortality rate compare favorably with cities in the United States, or any other parts of the civilized world. The following tables indicate the effectiveness of the preventive work of sanitation on the Isthmus:

Comparative Statement of Death Rates Among Canal Employes on the Isthmus of Panama Under the Original French Company for 1884, the Year the Maximum Number of Employes were Working, and the American Commission, 1904 to 1912, Inclusive.

Year.	Average No. of Employes.	No. of Deaths, Disease Only.	Death Rate per 1,000 Disease Only.	Lives Saved.
1884......	17,436	1,198	68.69	......
1904......	6,213	55	8.84	422
1905......	16,512	412	24.96	722
1906......	26,547	1,046	39.40	778
1907......	39,238	964	24.57	1,731
1908......	43,891	381	8.68	2,634
1909......	47,167	356	7.55	2,884
1910......	50,802	381	7.50	3,109
1911......	48,876	374	7.65	2,983
1912......	50,893	325	6.37	3,172
Total for nine years.				18,435

Total Population of Panama, Colon and Canal Zone and Death Rates in Same.

Year.	Population.	Annual Average Death Rate per 1000	Lives Saved.
1904.........	35,000	52.45	.....
1905.........	56,624	49.94	142
1906.........	73,264	49.10	299
1907.........	102,133	33.63	1,922
1908.........	120,097	24.83	3,317
1909.........	135,180	18.19	4,631
1910.........	151,591	21.18	4,740
1911.........	156,936	21.46	4,863
1912.........	146,510	20.49	4,682
1913 (June 30)	130,456	21.10*	4,090
Total for nine and a half years..................			28,686

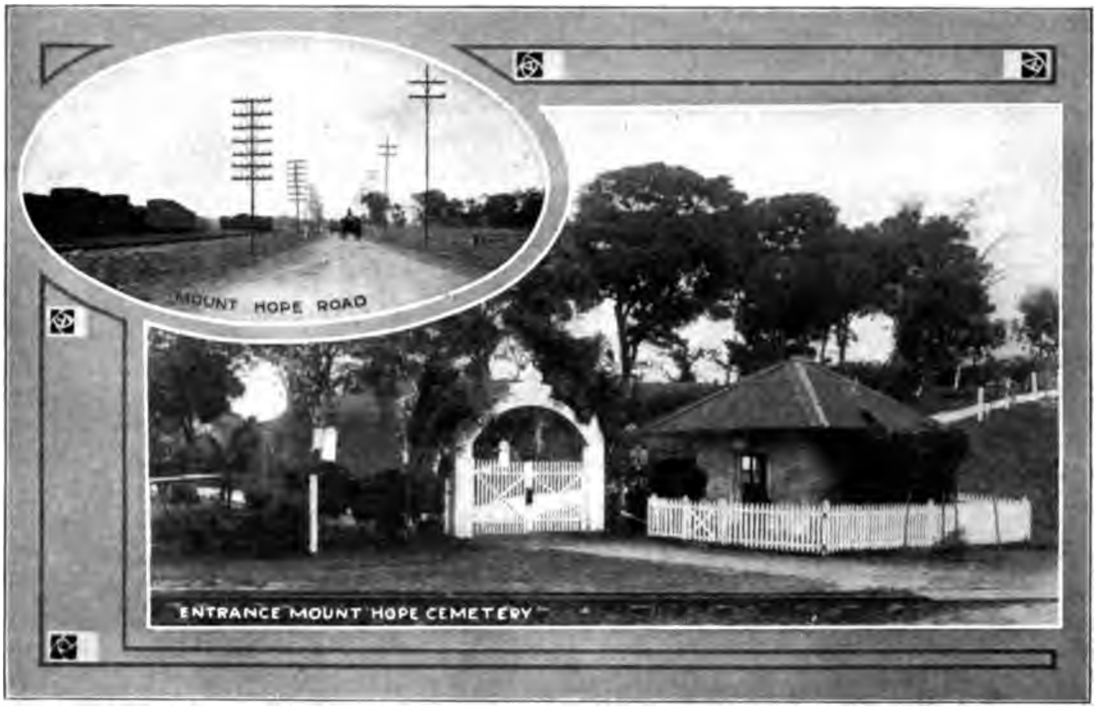
*Computed on six months' figures, but averaged for a year.

Only two cases of bubonic plague have developed on the Isthmus since American occupation. These occurred in Balboa, the first in June, 1905.

CAMACHO RESERVOIR

LAS SABANAS ROAD

Panama, Colon, and the towns in the Canal Zone were without water mains or sewers in 1904. Eight reservoirs have been built, and now water is plentiful; sewers ramify the cities, and the garbage is collected daily and burned. Many good roads have also been built, and the Las Sabanas road is much used by automobile and horseback riders. The United States advanced the money for this work, but Panama is to pay it back inside of 50 years.



On the Mount Hope Road between Cristobal and Gatun, is Mount Hope Cemetery, once known as Monkey Hill, where thousands of French Canal employes, victims of yellow fever, lie buried. Under American supervision the cemetery has been greatly beautified. Each of its avenues is lined with a different kind of fruit tree.

The village was immediately cleaned and disinfected, and a crusade against rats, the fleas of which are the carriers of buboinc, was started. A "rat" brigade was set at work in Panama; rat traps were issued free to all persons who wished them, and a bounty was placed on each rat delivered to the health department.

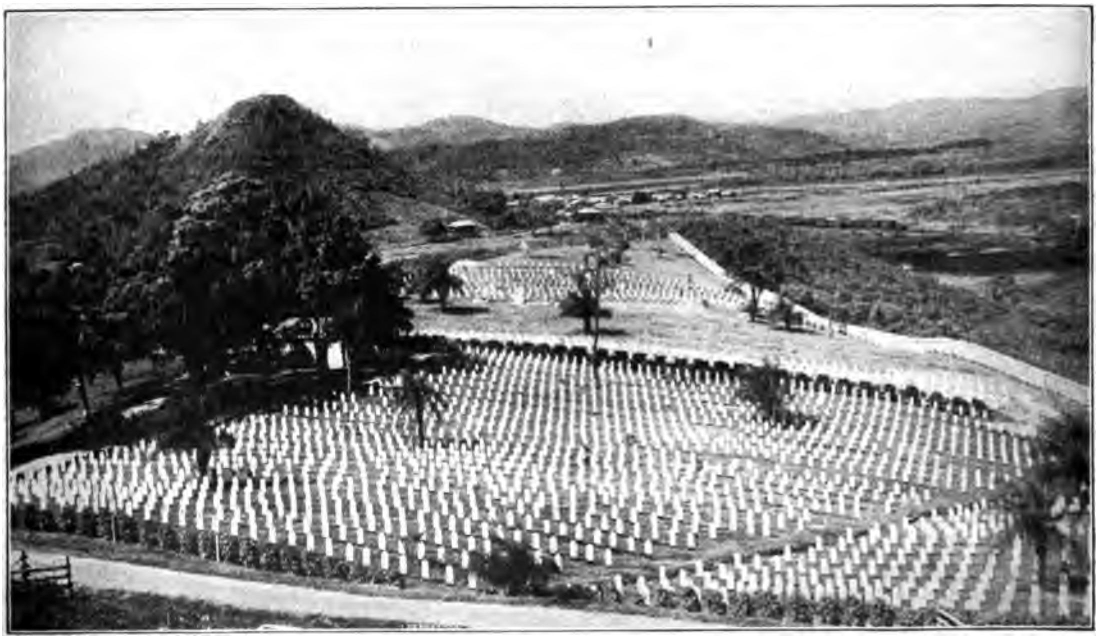
In addition to the preventive work done by the Department of Sanitation, it maintains two large hospitals, one at Colon and the other at Ancon, and each settlement has a dispensary with a physician in charge. There is also maintained a large asylum for the insane at Ancon, while at Palo Seco, a few miles east of Panama, there is an asylum for lepers. There is also a sanitarium on Taboga Island, about 12 miles out in the Bay of Panama, where convalescent white patients are given a week or more to renew fever and work-worn tissues.

One of the most important things shown by the success of sanitary work on the Isthmus has been expressed by Colonel Gorgas many times, as follows: "Natives in the tropics, with the same sanitary precautions that are taken in the temperate zones, can be just as healthy and have just as small a death rate as inhabitants in the temperate zones. To bring this about no elaborate machinery is necessary. The result can be attained by any community, no matter how poor, if it is willing to spend sufficient labor in cleaning, and to observe well-known rules with regard to disease. The Anglo-Saxon can lead just as healthy a life, and live just as long in the tropics as he can in his native climate."

The total cost of the work of the Department of Sanitation up to the first of July, 1913, was $16,250,164.93. This seems to be an excessive cost until it is considered that this amount includes the maintenance of modern hospitals, dispensaries, and quarantine stations at Colon and Panama, costing more than half of the total amount. To this is added the cost of street cleaning and garbage collecting, draining and reclaiming swamp land, the salaries of some 15 chaplains, the care of cemeteries and the carrying on of a general undertaking and embalming business. Colonel Gorgas when he said that it is within the power of the people of tropic countries to be just as healthy as those in the temperate zones, figures the actual cost of sanitary work on the Isthmus to the American Government will be a little more than a cent a day per capita, based on a population of 140,000.

RIGID QUARANTINE MAINTAINED

Since May, 1904, the quarantine on the Isthmus has been under American control with stations at Colon, and on Culebra Island near the Pacific entrance to the canal. In spite of the fact that ports on both sides of the Isthmus, north and south of Colon and Panama, have been infected with bubonic plague, cholera, smallpox and yellow fever, the quarantine has been successfully maintained. All employes of the Commission arriving on the Isthmus have to submit to vaccination unless they can show a good scar. Ships arriving at the Isthmus from infected ports are required to fulfill seven days of quarantine from the time of their departure. Guayaquil, Ecuador, where yellow fever has been endemic since the first white man landed on the west coast of South America, and where bubonic plague has recently gained a foothold, is about four days steaming for fast ships. As ships stopping at Guayaquil load and unload cargo where they are in danger of infection, it is necessary for them to be fumigated before they sail for Panama, and it is also necessary that the 7-day period of quarantine be fulfilled from the time of such fumigation. Ships making the trip in four days would, therefore, have to lay in quarantine at Culebra Island three days before they could unload their cargo and discharge passengers at

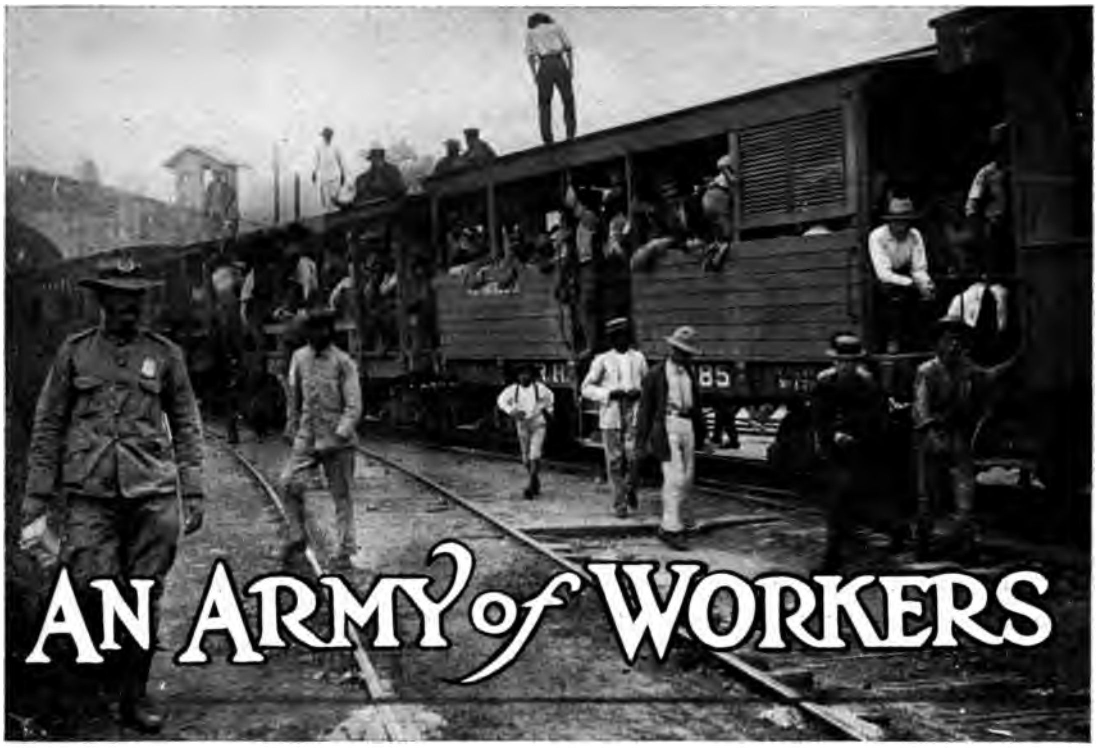


Ancon Cemetery.

Taboga Island, 12 miles out from the main land, in Panama Bay. It is noted for its sea bathing, and its pineapples. The native section is primitive and picturesque and contains one of the oldest churches in this section.

Balboa. In case a ship arrives which cannot show a certificate that all regulations have been properly complied with before leaving Guayaquil, then it is necessary that the vessel be fumigated on its arrival at Panama, and pass through the 7-day detention period at that port. On the Atlantic side, at the present time, ships sailing from La Guaira, Venezuela, are compelled to consume seven days, and from Santa Marta, Barranquilla, and Cartagena, they are compelled to consume six days from the time of sailing. With a rigid quarantine at the two ports of the Canal, and with the effective work of the sanitary inspectors kept up as it has been in the past, it seems improbable that a serious epidemic of yellow fever will ever break out on the Isthmus again.

The Canal Commission's Sanitarium on Taboga Island, where all sick white employes are sent to convalesce. The employes are given 30 days vacation each year, with full pay, and 30 days sick leave each year, when necessary.



AN ARMY OF WORKERS

IN the month of September, 1904, the Canal force was at its lowest point, numbering about 500. In November, 1905, the force had been increased to approximately 17,000, and in November, 1906, it was practically the same. The following tables show the highest monthly record for each year since 1906:

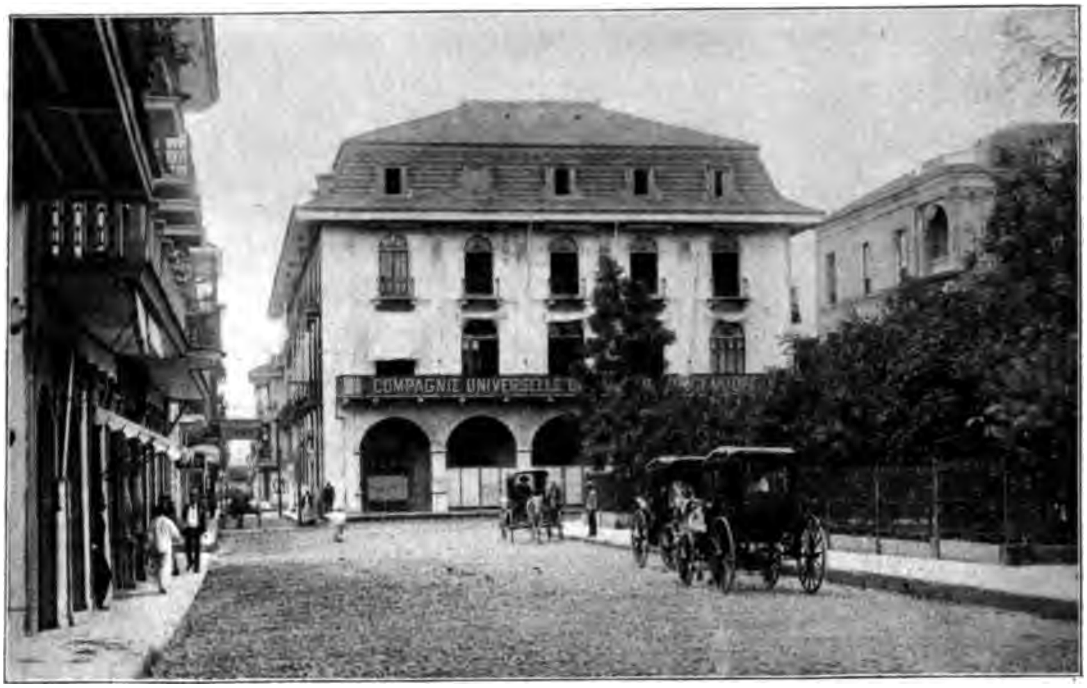
1907—October	31,967	1911—December	37,826
1908—April	33,170	1912—November	40,159
1909—October	35,405	1913—March	44,733
1910—March	38,676		

The Canal force reached its highest point in March, 1913, with 44,733 men, divided as follows: Panama railroad, 5,248; Panama railroad commissary, 1,274; Isthmian Canal Commission, 32,567; contractors, 5,644; total, 44,733.

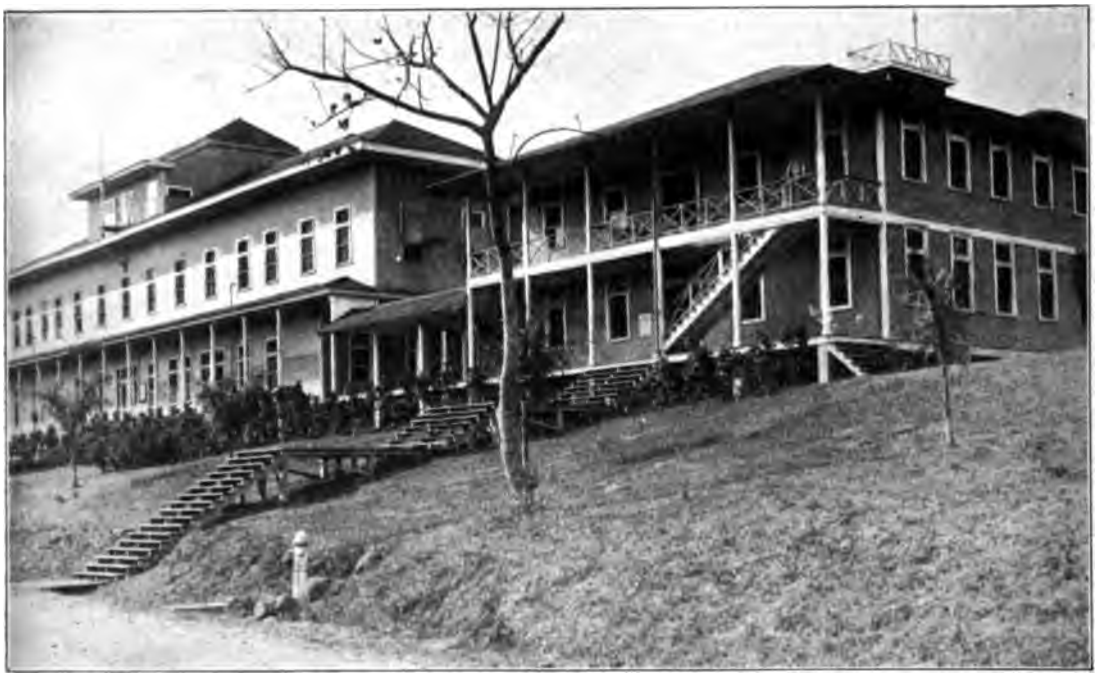
Of the above, the "gold" force, composed almost entirely of Americans, numbered 4,487; West Indian laborers employed by the Commission, 10,406; West Indian artisans employed by the Commission, 13,065; European laborers employed by the Commission, 4,609. The balance was in the employ of the Panama railroad and of the contractors. Most of the West Indian laborers received 10 and 13 cents an hour, while a few received as high as 20 cents an hour. The European laborers received 16 and 20 cents an hour. The West Indian artisans were for the greater part paid on a monthly basis, the balance receiving from 16 to 44 cents an hour.

GETTING THE FORCE TOGETHER

As the work of making the Isthmus a healthful place in which to live progressed and better living conditions were inaugurated, the work of recruiting and maintaining a labor force became easier. However, it was never possible to keep a stable force and, under the best conditions, the American force changed



The old French Administration Building in Panama City, used by the American engineers as their office headquarters during the first two years of Canal construction.



The Administration Building at Culebra, the present engineering headquarters, containing the office of Colonel Goethals. The headquarters will be changed to Balboa as soon as the new administration building, which is now being erected there, is completed.

considerably, the skilled mechanics about 80 per cent. during the year 1910, and that of the administrative employes about 45 per cent. During the early years, recruiting offices were opened in Europe, the West Indies and in the United States, and men representing nearly every nationality were brought to the Isthmus under contract with the Commission. Nearly all the supervisory positions, and the positions requiring skilled labor, are filled by Americans. These include the mechanics, carpenters, plumbers, steam shovel engineers and cranemen, locomotive engineers, railroad conductors, firemen, policemen, civil engineers, clerks, doctors, nurses, school teachers, etc. The clerical force, draftsmen, doctors and nurses are included in the classified civil service, but all other positions are excepted from civil service requirements. The common and unskilled laborers represent nearly every nationality. The greater part, however, are negroes from the West Indies; the Spaniards, Italians and Greeks form the greater part of the European labor force.

Colonel Goethal's motor car, commonly known as the "Yellow Peril" from its color; also as the "Brain Wagon." Several of these cars have been shipped to the Isthmus, and are used by the officials in inspecting the different parts of the work.

During the years 1906-7-8, there were recruited in Europe 11,300 laborers, 8,200 of which were Spaniards, 2,000 Italians and 1,100 Greeks. These men were obtained under contract, and were promised free quarters and employment at 20 cents an hour for as long as the canal work should last. Their passage money was advanced to them, and was deducted from their monthly pay, so that out of a total cost of $508,770.83 for recruiting Europeans, all but $100,000 was returned from the laborers' wages. Recruiting ceased in Europe in 1908, as the supply of labor became constant through the arrival of those on the Isthmus who, having learned of the favorable working conditions, came seeking employment of their own volition. Those who did not come under

The Administration Building at Ancon, containing various offices, including those of the Secretary of the Commission, and the heads of the Departments of Civil Administration, Sanitation and Law.

The Division Engineer's office at Gatun. Gatun is the engineering headquarters for the Atlantic Division, which embraces the construction from deep water in the Caribbean Sea to include the Gatun Locks and Dam.

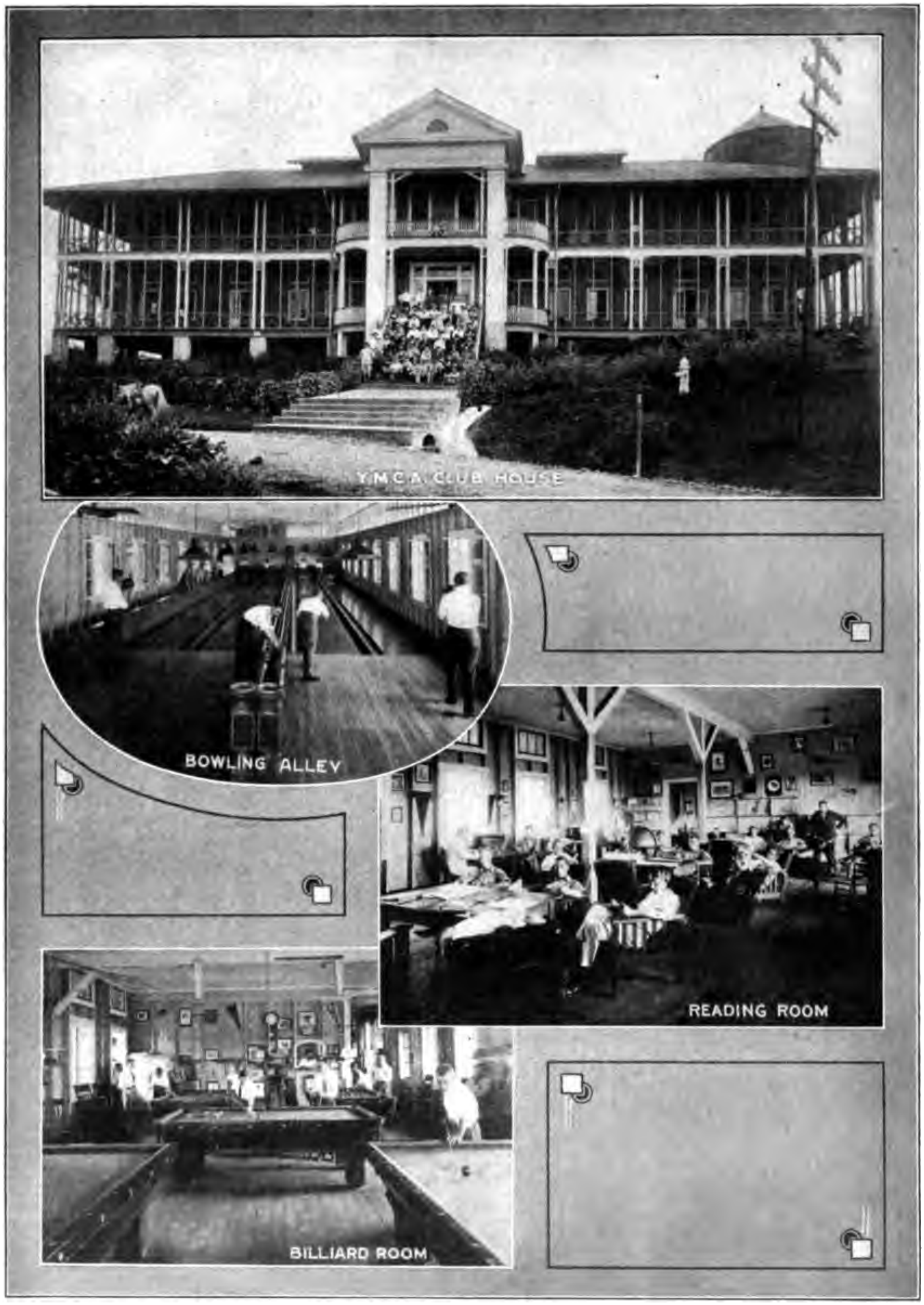
contract were paid 16 cents an hour for three months, and were then raised to 20 cents an hour if their work had been satisfactory. Laborers obtained under contract will be repatriated at the expense of the Commission, but their number will not be large as, undoubtedly, many of them will find work elsewhere.

The recruiting of laborers in the West Indies was carried on several years after it had ceased in Europe, the last importation of negroes from Barbados having taken place in January and February of 1913. The total number of West Indians recruited reached 30,619 at the end of 1912. Of this total, 19,444 were brought from Barbados, 5,542 from Martinique, 2,053 from Guadeloupe, 1,427 from Trinidad, and the balance distributed among the other islands of the West Indies. Recruiting of laborers was not allowed in Jamaica after 1905, in which year 47 had been brought to the Isthmus under contract. Although this class of laborer was not recruited, he is well represented on the Isthmus in the labor force, for the Jamaican came of his own volition although he was required to deposit the amount of his return fare before he could leave that island. In October, 1913, about 10,000 West Indians were laid off as the dry excavation in Culebra Cut came to an end. About 5,000 of these men will go into the employ of the United Fruit Company and the balance, which are unable to find work elsewhere, will probably go back to their island homes.

Colonel Goethal's residence at Culebra.

KEEPING THE AMERICAN EMPLOYES CONTENTED

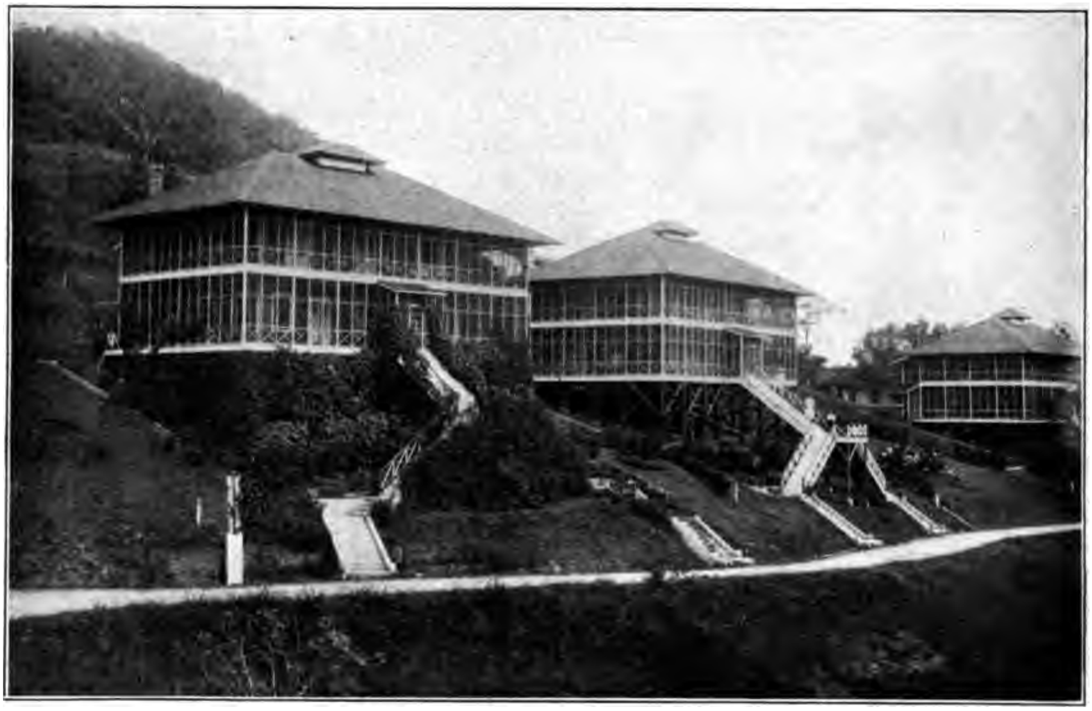
In addition to much higher wages than those prevailing in the United States, many inducements were offered to persuade Americans to go to the Isthmus to fill the supervisory positions. Free quarters, free medical, surgical, and hospital attendance, and six weeks' annual leave of absence with pay are



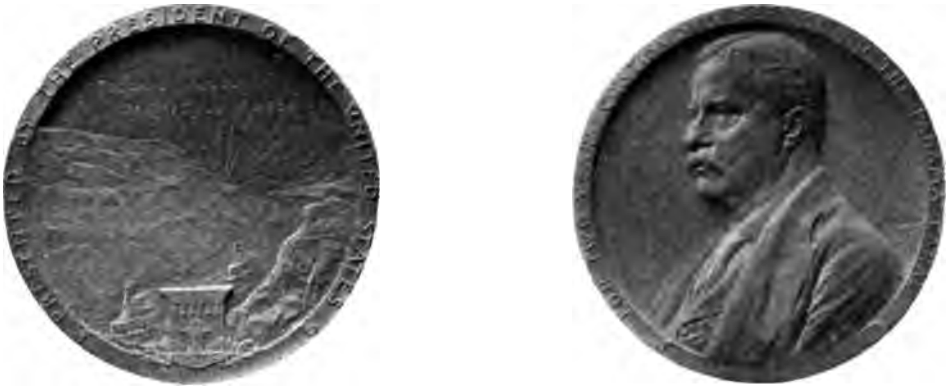
The Y. M. C. A. Clubhouse at Gatun. The Government early discovered that to keep the employes contented, they must be given amusement; accordingly seven clubhouses were erected which are now self-sustaining. They are conducted under the auspices of the Y. M. C. A., but along broader lines than elsewhere. They furnish attractive places for the men to congregate, and the social work consists of entertainments brought from the States, as well as local dramatic, musical, minstrel and vaudeville productions.

provided. Free transportation is also furnished new employes from the United States and also on their return after having completed two years of satisfactory service on the Isthmus. On their vacation leave, the employes are granted a reduced rate on the various steamship lines running between the Isthmus and the United States. On the Panama railroad steamships the employes' rate is $20 one way for those appointed prior to January 1, 1909; for employes appointed after that date, the rate is $30; the regular rate is from $75 to $90 from Colon to New York.

The problem of maintaining a constant force of Americans was not solved, however, until means were found to keep it as nearly contented as possible. To do this, it was thought necessary to encourage employes to bring their families to the Isthmus, and to this end, furnished family quarters were provided, with free fuel, water, and light. It is generally agreed that the comfortable married quarters supplied by the Canal Commission has led a good many to forsake the state of single blessedness, but nearly all are wise enough to wait for an assignment before "popping the question." The demand for family quarters has always been greater than the supply, and one has to take his turn on the waiting list. If he is an old-timer and has not been out of the service since 1908, he is on what is known as the No. 1 list, and stands a fair show of getting quarters quickly. One who has been employed since 1908 goes on the No. 2 list, and there is generally several months' weary wait before his turn comes, as the total number of applicants up to the latter part of 1913 had been rarely less than 600. Some insist on bringing their families anyway, in



Owing to the necessity of building on the side of the hill at Ancon, many steps are required at some of the quarters, as shown in the above picture. Usually more level sites were utilized for quarters. The houses, with the surrounding shrubbery, make a beautiful scene.



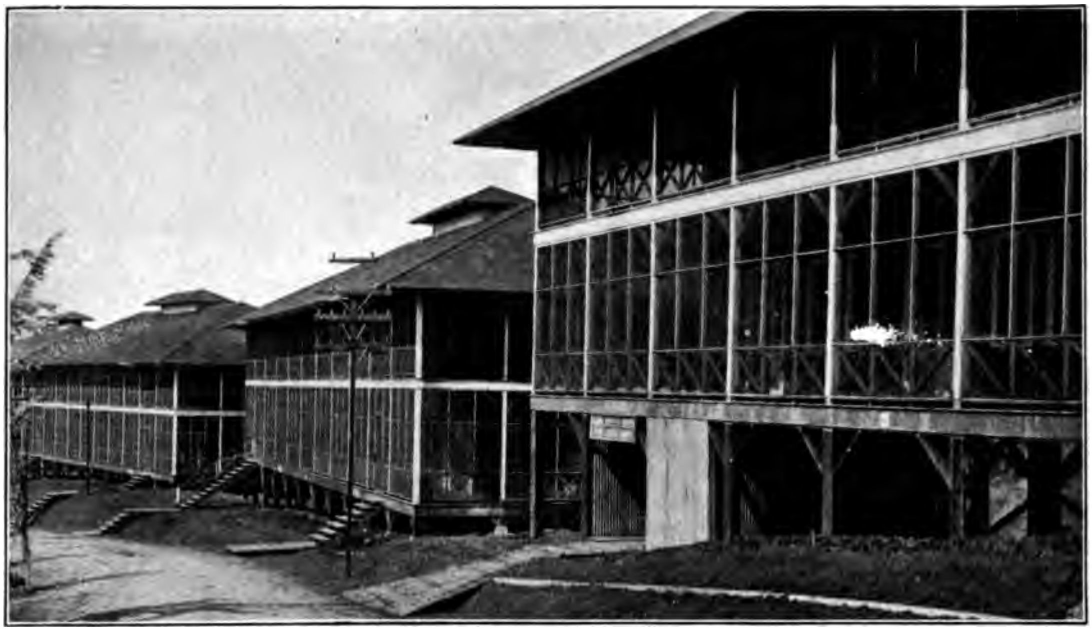
Canal medal awarded white employes on the "Gold Roll" for long service. The medal is for two years continuous service, and for each additional two years a bar is earned. The idea was suggested by ex-President Roosevelt during his visit to the Isthmus in 1906.

which case, they are compelled to rent outside rooms, which are expensive and in no way compare with the comfortable Commission quarters.

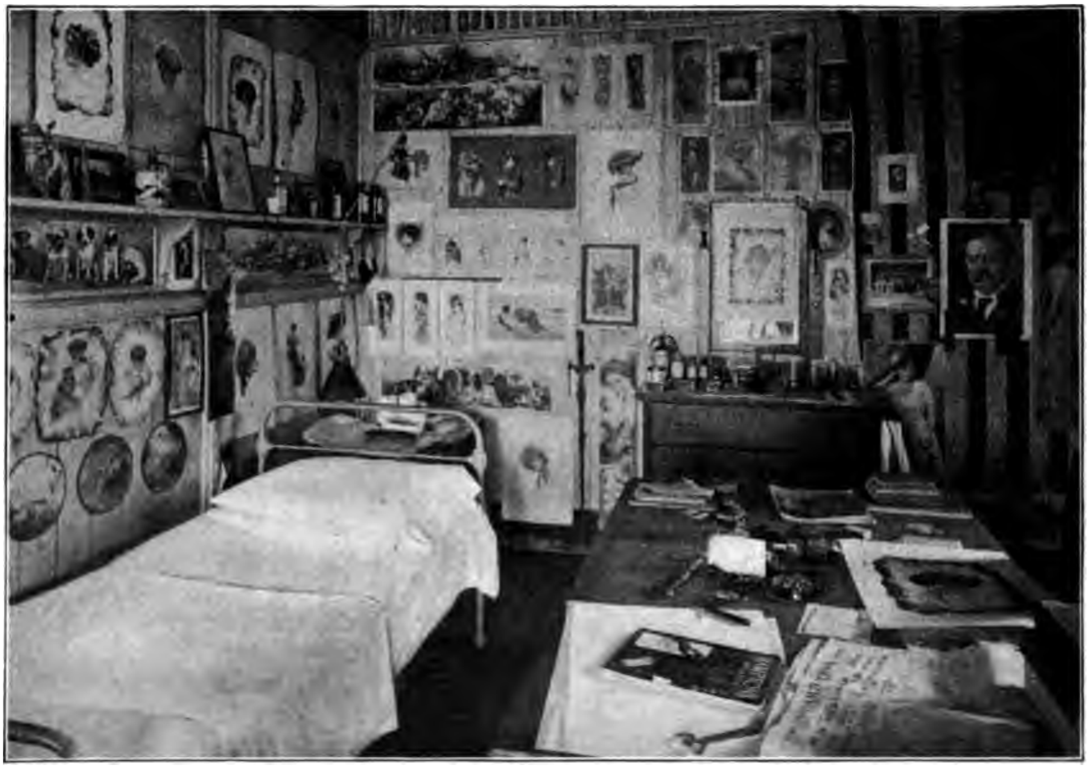
Family quarters are graded according to the size of an employe's salary, so much floor space to each $100 he earns, or fraction thereof. Employes receiving $200, or over, are assigned, where possible, to one-family houses; those receiving less are quartered in two and four-family houses. The quarters, both family and bachelor, include a number of different types designated as Type 17, or Type 18, as the case may be, and were built from special designs to make them suitable for residence in the tropics. The rooms are uniformly well ventilated, and there is plenty of veranda space. Chairs, tables, beds, cook stove, refrigerator, bureau, chiffonier, sideboard, mattresses, mats, etc., are supplied free; bed linen and kitchen utensils must be obtained by the occupant.

The bachelor employe has always contended, and possibly with some grounds, that he has been shown less consideration than the married employe.

The Nurses have this building to themselves, called the Nurses' Home, at Ancon Hospital.



Each Zone settlement has buildings for bachelors commensurate with the force quartered there, furnished free by the Government. This type of quarters contains 24 rooms, with two men assigned to each.



Frankly, the bachelor employe does not have the privileges his married friend has, still he manages to get along pretty well, as evidenced by the interior of his quarters.

In most cases, he must share his room with another, and there has been times, when three were placed in one small room. On the other hand, although he probably will not admit it, the bachelor employe has been greatly benefited by the presence of women and children in the various construction camps.

It has been figured that bachelor labor costs less than that of married labor, taking into consideration the quarters assigned, allowance for fuel, light, water, care of grounds, and janitor service. A comparison follows:

PLANT

	Married	Single
Quarters	$1,800.00	$500.00
Furniture	140.00	25.00
Total	$1,940.00	$525.00

MONTHLY COST OF ALLOWANCES

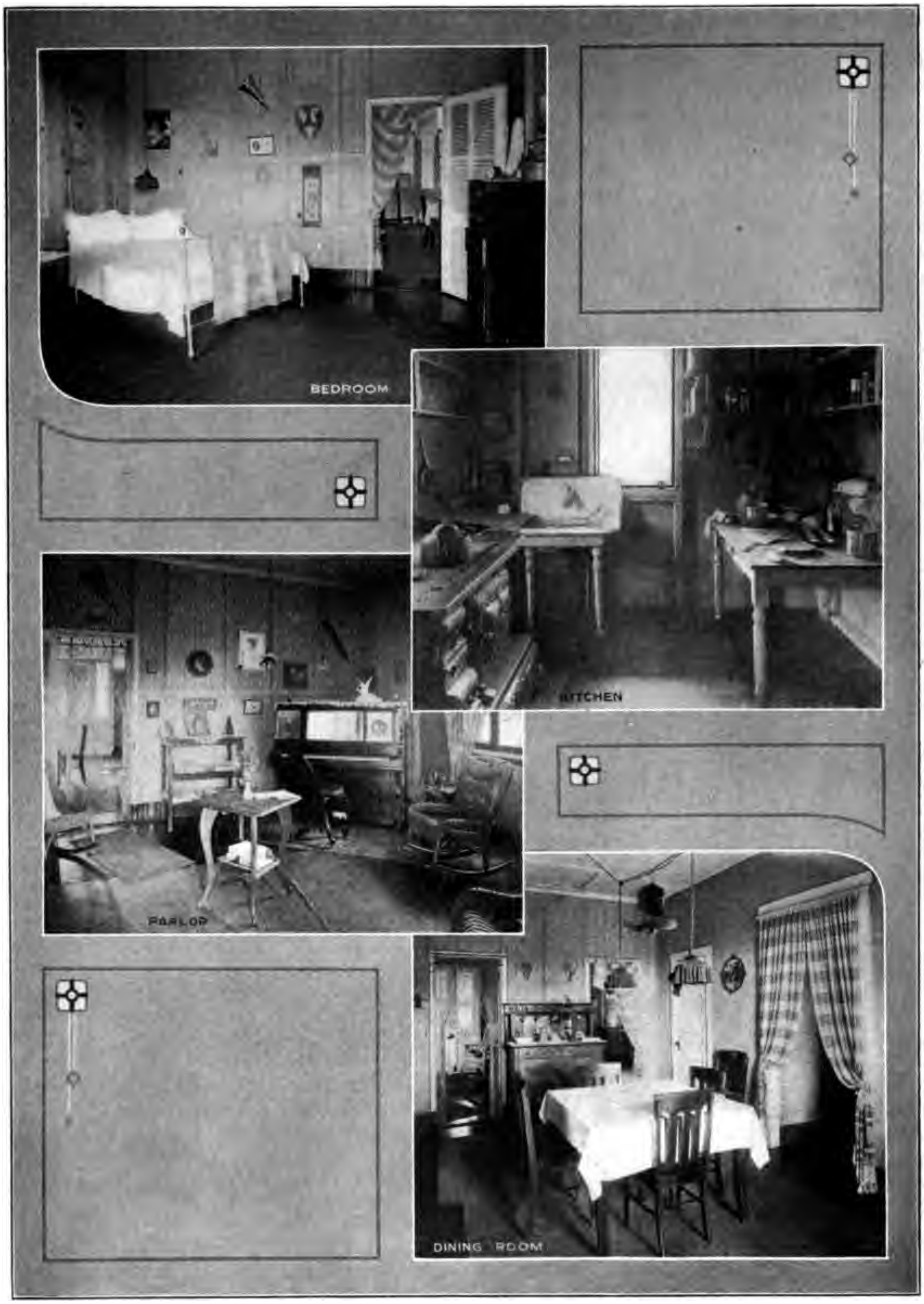
	Married	Single
Fuel (coal and kindling)	$4.30	....
Light	4.20	.30
Water	1.80	.45
Distilled Water	.50	.10
Care of grounds, removal of garbage	1.20	.15
Janitor service	....	1.25
Total	$12.00	$2.25

Assuming a six years' service, a married man may be said to represent an expenditure of $3,000, and a single employe $750. In addition to the above, the married man also receives the benefit for his children of an excellent school system. This increased cost, however, is supposed to be offset by the stability of the married force.

Members of the Ancon Study Club.

The visitor to the Isthmus is quick to note that he is in a new atmosphere. The bringing together of people from every part of the United States, and the consequent interchange of ideas has given birth to a spirit of tolerance, of a broadening of the mind, and has led to the abandonment in a large measure of narrow-minded prejudices embodied in the selfish thought that "My way is right, yours is bound to be wrong," a rut that people in small communities in the States are so prone to fall into.

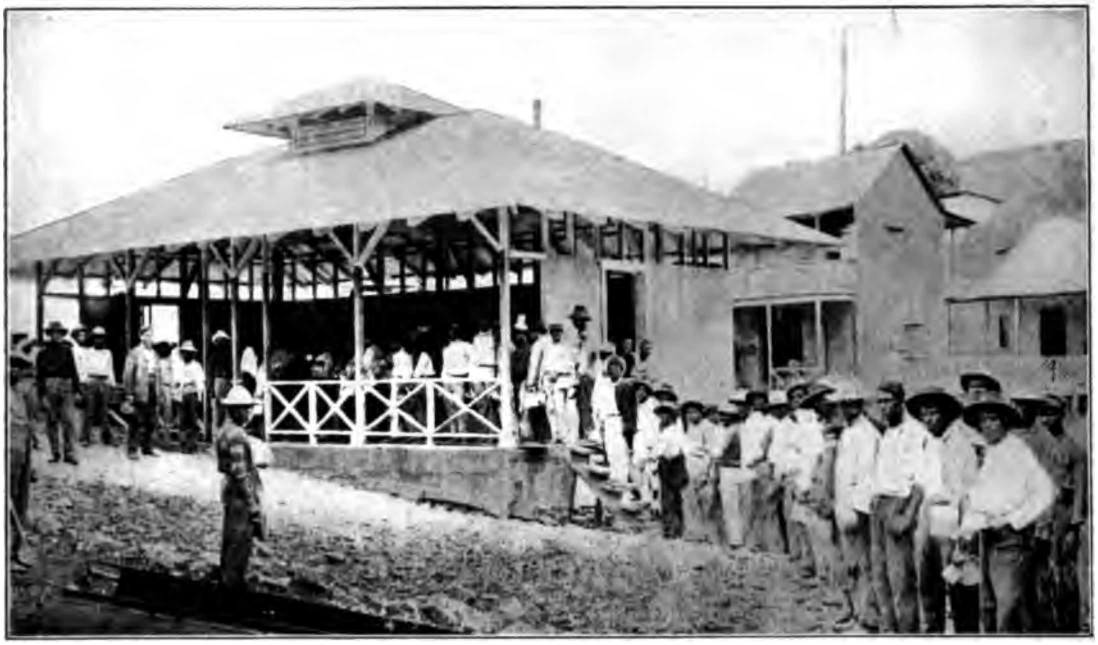
To further the feeling of contentment and to make of the Canal Zone a transplanted American community, churches and schools were organized. Church work was authorized by the Commission on October 4, 1905. There are about 40 church buildings in the



A Cozy Home in the Canal Zone. Married quarters are furnished free by the Government, and fuel, light and water supplied without charge. Assignments for quarters are made by the district quartermaster, based on date of application, rate of salary, and date of entry in the service.

Zone, representing nearly every Christian denomination. The greater part of these churches are owned by the Isthmian Canal Commission, which has in its employ ten chaplains, representing six different denominations. It has been the policy of the Commission to encourage church work, and it granted land and sold building material at cost for church buildings. Religious services are also held in the Commission club-houses and lodge halls.

There are six Commission clubhouses, one each at Corozal, Culebra, Empire, Cristobal, Gatun, and Porto Bello. The one which was at Gorgona will be re-erected at Pedro Miguel, and a clubhouse of a permanent type is proposed for the new town of Balboa. These clubhouses were constructed and equipped by the Commission and are conducted by trained secretaries appointed by the International Committee of the Y. M. C. A. The work was planned to meet the needs of the men morally, educationally, and physically, and to this end reading rooms, bowling, pool and billiard rooms, gymnasium classes, educational classes, chess, checker, dramatic clubs, etc., are maintained by them. All white employes are eligible to membership upon the payment of the regular membership dues of $10 per annum.

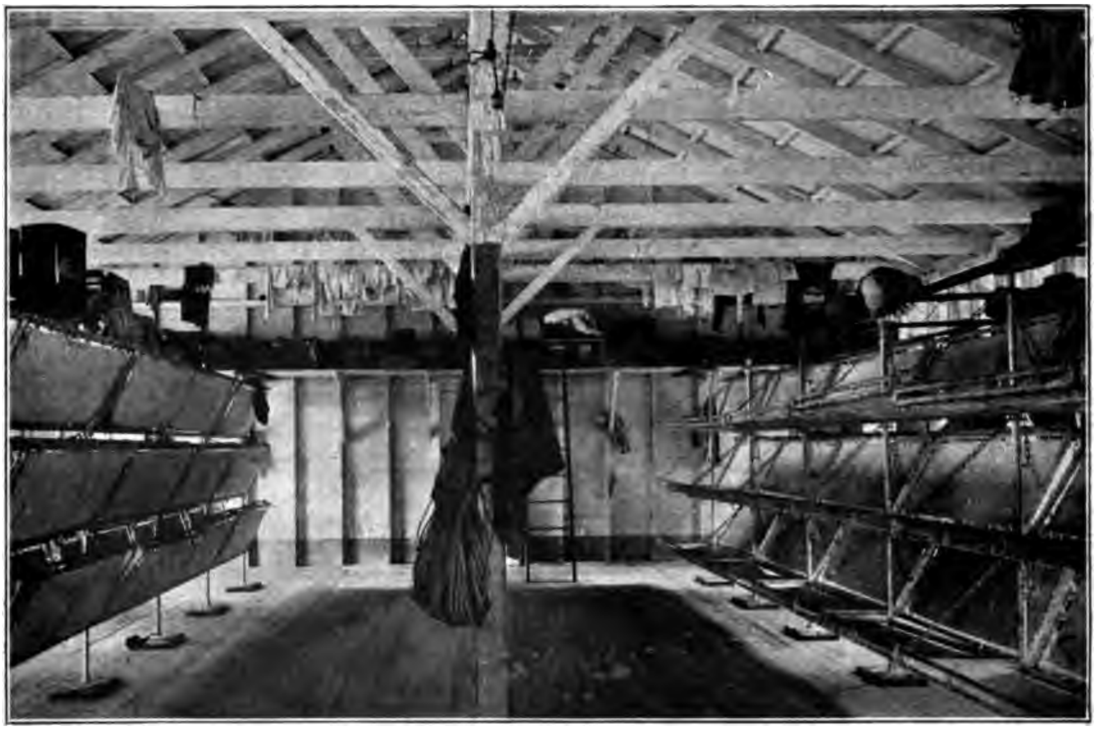


Mealtime at a Government kitchen for negro laborers. The negroes are served three rations a day at a total cost of 27 cents.

The desire for music was also recognized by the Commission and until March 1, 1913, it maintained a first-class band of 35 pieces. The members were all employes, and they received additional pay for their services. The band was first organized in September, 1905, as a private organization, and the Commission took over its maintenance on March 27, 1907. Concerts were given weekly in the different towns in the Canal Zone.

Nearly every construction village in the Zone has a Commission building which is devoted to the use of fraternal organizations, and a dozen secret organizations, as well as labor organizations, are represented on the Isthmus.

Typical camp for European laborers. There are separate camps for each class of employes, and the American section of a Canal Zone town is entirely by itself.



Interior of a bunk house for negro laborers. The men sleep on Standee berths, arranged in parallel rows, in three tiers.

The lodge halls are assigned free of charge for weekly meetings, and are also used for entertainments, club meetings, and dances. The Commission has encouraged baseball, tennis, rifle, and pistol clubs. A dancing club holds fortnightly balls in the Hotel Tivoli at which Isthmian society is seen at its best. This social organization recently passed through a crisis over the question of "turkey-trotting" and kindred dances. In addition to the many clubs in the Canal Zone which are more or less under the sway of the Commission, the employes wishing a little more freedom founded the Strangers' Club in Colon, and the University Club in Panama. These two clubs do not confine their membership to Commission employes. The "smokers" and "hops" given by these two clubs are popular both in the Canal Zone and in the cities in which they are located.

Mess hall for European laborers. Three rations are served European silver employes for 40 cents a day.

Following up its policy of encouraging employes to bring their families to the Isthmus, Ex-president Taft authorized the employment by the Commission of Miss Helen Varick Boswell to undertake the task of starting a social movement among the women in the Canal Zone. Miss Boswell arrived early in September, 1907, and when she left in October, she had organized nine women's clubs in the larger villages. The purpose of these clubs was to provide recreation and social intercourse for the wives and daughters of the American employes, just as the clubhouses were established as centers of recreation for the men. These nine clubs were finally affiliated with the General Federation of Women's Clubs in the United States. On April 19, 1913, the Canal Zone Federation completed six years of activity, and on that date it disbanded on account of the approaching completion of the Canal work.

Several societies, designed to perpetuate the canal work, have been organized. The first one of these, the Society of the Incas, limits its membership to

Lodge hall at Las Cascadas. All the leading secret societies are represented in the Canal Zone, and lodge halls have been erected for their use by the Government. No rental is exacted. The Zone has also a federation of women's clubs.

Reading room in the University Club, Panama City. The University Club and the Strangers' Club in Colon, do not confine their membership to Government employes.

employes who entered the service in the year 1904. Another is called the Society of the Chagres, and is composed of men who have seen six years of service. A third society has recently been organized, known as the Association of Panama Canal Builders, to which any gold employe may belong.

A lunch hour scene at Gorgona shops, before they were destroyed to avoid inundation by the rise of Gatun lake.

All gold employes who have served two years under the Canal Commission are entitled to a medal. This souvenir is the outcome of the thoughtfulness of ex-President Roosevelt, who, just before he sailed from the Isthmus on November 17, 1906, said: "I shall see if it is not possible to provide for some little memorial, some mark, some badge, which will always distinguish the man who, for a certain space of time, has done his work well on the Isthmus, just as the button of the Grand Army distinguishes the man who did his work well in the Civil War." The medal is of bronze, one and one-half inches in diameter, and is made from brass, copper, and tin taken from old French scrap. On the reverse side is a bust portrait of ex-president Roosevelt, with

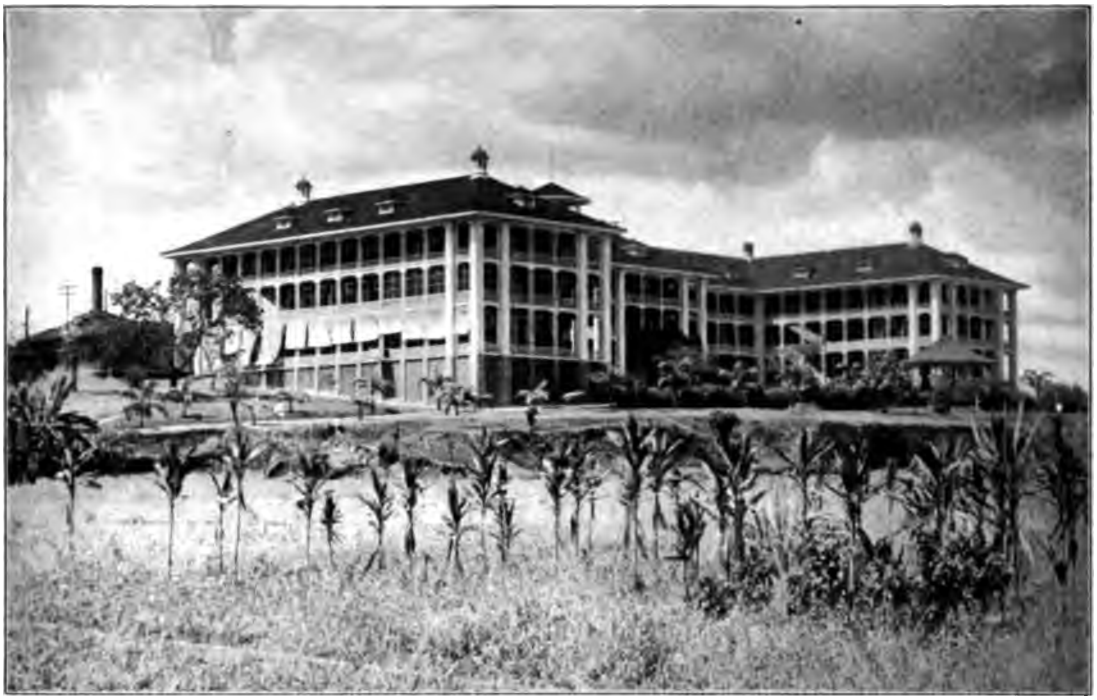
Labor train arriving at dry dock, Cristobal. A great many employes live at a distance from their work, and are transported to and from their homes in labor trains.

space underneath for the service record, and around the rim the words "For two years' continuous service on the Panama Canal." On the obverse is a picture of Culebra Cut with ships passing through, the Seal of the Canal Zone, a name plate, and the words "presented by the President of the United States," cut into the rim. A bar is awarded for each two years' additional service, and there are employes who have earned not only the medal, but three bars as well. The medals are made at the Philadelphia mint, and are distributed yearly. No duplicates are issued.

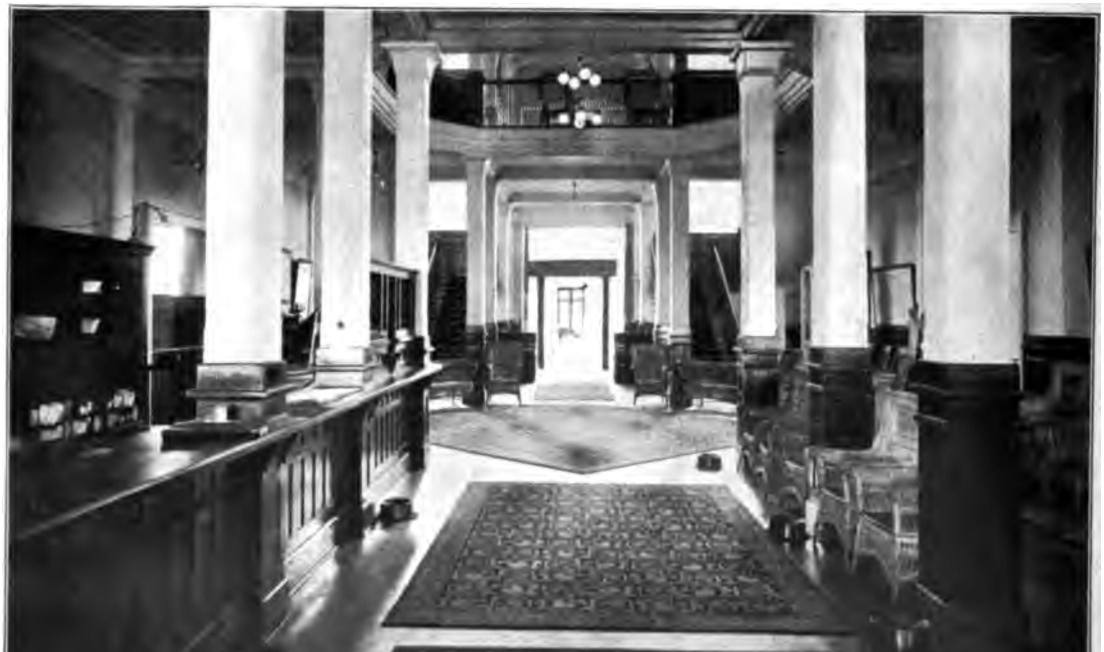
Interior of Mount Hope printing plant. The majority of the Canal Commission's printing, including The Canal Record, is done here.

The Canal Record, published weekly under the supervision of the Canal Commission, contains a résumé of the progress of canal work, official circulars, social and church notes, etc. It is distributed free to all gold employes of the Commission and the Panama railroad; in fact, so widely has it become known that its circulation, between 16,000 and 17,000 weekly, extends to people inter-

General storehouse at Mount Hope, near Colon, from which supplies are drawn by smaller store houses established in all the principal Canal Zone settlements. A large amount of material is required to be kept constantly on hand.



The Hotel Tivoli at Ancon, a picture familiar to anyone who has been on the Isthmus. It is the principal stopping place for tourists, and is owned and managed by the United States Government.



Lobby of the Hotel Tivoli. One of the hotel's first guests was ex-President Roosevelt, and the suite he occupied is known as the President's suite.

ested in the construction of the canal in all parts of the globe. It is printed at the Canal Commission's printing plant at Mount Hope, and is under the direction of the Secretary of the Commission, Mr. Joseph Bucklin Bishop.

FEEDING AND CLOTHING THE CANAL ARMY

It is estimated that with employes and their dependents there were about 65,000 persons depending upon the Canal and Panama railroad work for their source of income during the height of activity, and these people had to be supplied daily with food, clothing and other necessaries. It was early realized that the demand for food and clothing could not be satisfactorily filled from local sources, for prices advanced steadily as the demand increased, so the Subsistence Department was created. This department is divided into two branches, commissary and hotel. The first commissary store was at Colon and was maintained by the Panama Railroad Company for the benefit of its employes. The commissary division does a general merchandising business, while the subsistence end has in charge the hotels or mess halls for the American employes and messes for the laborers. It also maintains the Hotel Tivoli at Ancon, patronized chiefly by transients. About 85 per cent. of the supplies for the commissary and subsistence departments are purchased in the United States, 10 per cent. in Europe, and five per cent. in Panama.

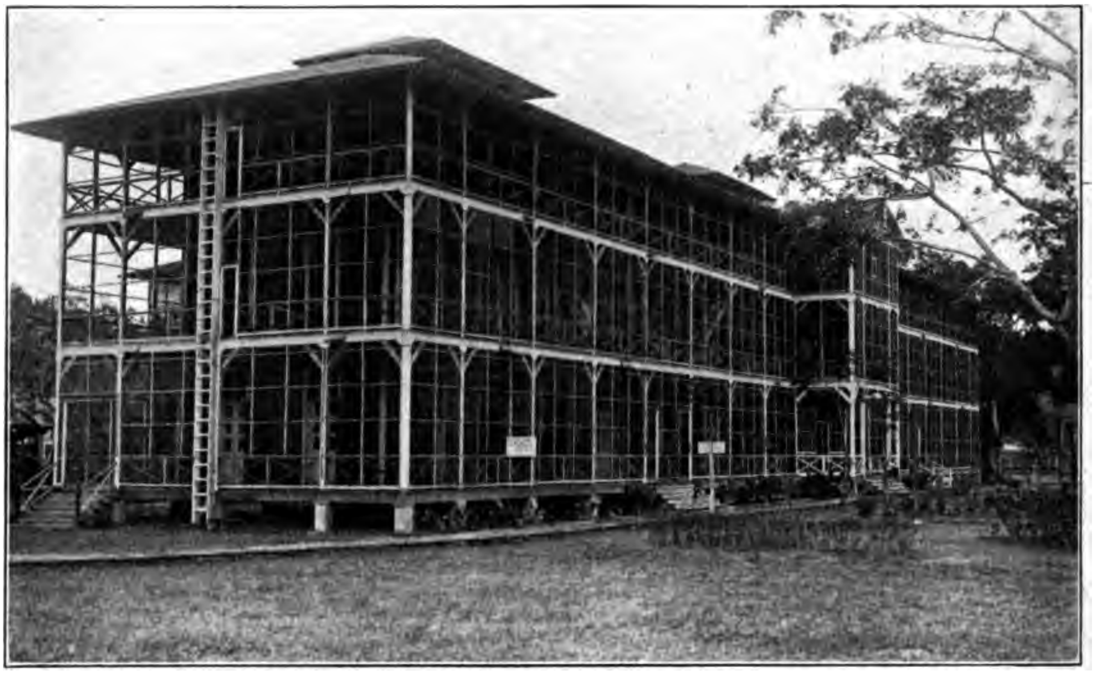
Commissary at Cristobal, oldest and largest on the Isthmus. This was operated by the Panama railroad for the benefit of its employes before the United States acquired the road. A commissary train makes an early morning daily run across the Isthmus distributing supplies to the branch commissaries.

In addition to the store at Cristobal each canal village has a branch commissary. Everything that an employe or his family usually requires, such as household goods, men's and women's clothing, groceries, meats, vegetables and fruits are supplied. In addition to the retail stores, cold storage, ice making, coffee

Public market at Culebra. These markets are located in many of the Zone towns, where the tropical fruits and vegetables may be obtained.

Ice and cold storage plant, Cristobal. Ice is sold at 40 cents per 100 pounds, and cold storage articles are cheaper, in many instances, than they are in this country from which they are imported. This is largely due to the system of buying in bulk and, in the case of meats, to the placing of contracts.

roasting, ice cream and laundry plants, and a bakery are operated at Cristobal. From this point a supply train, partly composed of refrigerator cars, crosses the Isthmus each morning, stopping at the different stations along the line where ice, meats, and other perishable articles are delivered. These goods are then distributed to the houses of employes and to the mess halls and branch commissaries by the Quartermaster's Department. No cash sales are made, all payments being made by the employes in the form of coupons ranging in value from one cent to 25 cents from books issued ranging in value from $2.50 to $15. The same method of payment is used in the hotels. These books are obtained by the employes for cash at stated places, or are supplied by the timekeepers, and the amount deducted from the employes' salary at the end of the month. They are not transferable, and in order that the privilege will not be abused, infractions of this rule is punishable by confiscation of the book and ten days' suspension for the first offense, and discharge for a second offense.



The Government hotel at Corozal, the first one erected by the Americans. These Government hotels are established in all of the Zone settlements. In them a white employe is served a better meal for 30 cents than he can usually procure for that price in this country. In one part of the dining room, employes are permitted to eat without their coats; in the other they must keep them on.

Due to the fact that the commissaries are not run for a profit, except to cover in the cost of the various plants, improvements, etc., and to the fact that the Government buys in large quantities under favorable contracts, the consumers on the Isthmus have not felt the high cost of living to the extent of people elsewhere. This is especially true of beef, the price of which during 1912 reached a point never before equalled in the United States. With but a few exceptions, the price of beef at the commissaries during this period was kept down to the previous price. During a single year, 6,453,138 pounds of fresh

The Commission laundry at Cristobal. It is equipped with up-to-date machinery and presents a busy appearance at all times.

The Commission bakery at Cristobal. During a single year the bakery used 20,233 barrels of flour, producing 6,014,667 loaves of bread, 651,844 rolls and 114,134 pounds of cake. Each loaf of bread weighs 16 ounces and costs the consumer three cents.

meat and 976,445 pounds of cured and pickled meats were brought to the Isthmus.

By printing 333,658 pounds of a total of 427,683 pounds of butter bought, the commissary was able to save in the price and also present it for sale in a much better condition than when purchased in the United States already printed. The price of coffee was also saved by the commissary operating its own roasting plant. In this plant 341,780 pounds of green coffee, producing 280,909 pounds of roasted coffee have been turned out in a year. The ice plant, with a capacity of 100 tons a day, delivers ice for 40 cents a hundredweight, or 20 pounds of ice delivered at the employes' door for eight cents. Another instance of effective manufacture and distribution was the operation of the bakery which during a single year used 20,233 barrels of flour producing 6,014,667 loaves of bread, 651,844 rolls, and 114,134 pounds of cake. Each loaf of bread weighs 16 ounces and costs the consumer three cents. In addition, the bakery enables the employe to purchase strictly fresh bread, cakes and rolls which he would otherwise not be able to obtain. The Americans on the Zone are great ice cream eaters, for a total of 138,551 gallons valued at $110,993.68 were consumed in a single year. The ice cream which is sold for 25 cents a quart is as good as can be obtained, fresh milk and cream being imported from the United States, in refrigeration, for its manufacture.

The principal street in Gorgona. This was one of the largest towns in the Canal Zone, but the buildings have all been removed as the waters of Gatun Lake will cover the original site.

In the industrial and experimental laboratory maintained by the commissary, extracts, talcum powder, soap, witch hazel, hydrogen peroxide, bay rum, tooth powder, and toilet preparations of various kinds are manufactured and sold to the employes at a considerable saving in cost. The experimental

Tennis court, Ancon. Tennis is a favorite pastime and tournaments are held frequently.

Opening game Athletic Park, Empire. The national game has held sway each dry season with at least one league made up of four or more clubs. Field meets are also held occasionally.

There are several excellent bathing places on each side of the Isthmus. A large pavilion has recently been erected fronting the beach Pena Prieta, Panama Bay, to which the street cars run. Sea bathing is enjoyed at 'Xmas time the same as on the Fourth of July.

department is maintained to insure the quality of all the goods sold in the stores.

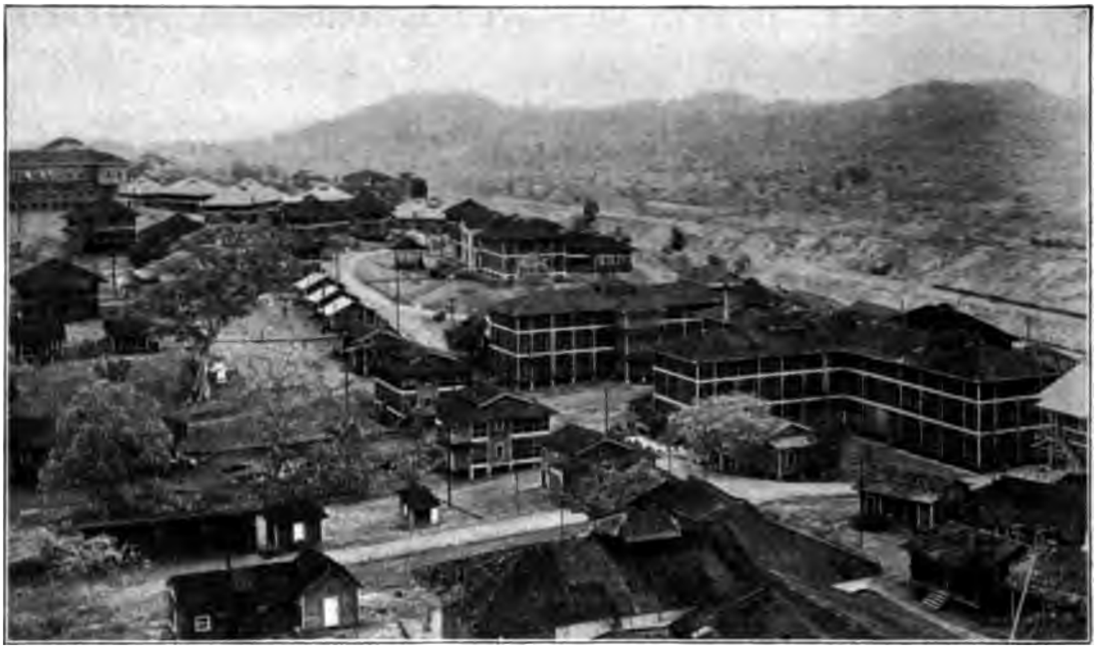
There are three classes of hotels and messes maintained where the labor force is fed, one for the white American employes where meals are served at 30 cents each, one in which Spanish laborers are served three meals for 40 cents, and one where negro laborers are served three meals for 27 cents. The food in all three cases is good and wholesome. The meals served in the American hotels, or mess halls, are substantial rather than dainty, but could hardly be duplicated in the United States for double the price charged. Although the laborers' messes serve wholesome food very cheaply, the greater part of the Spaniards prefer to eat at the little restaurants maintained near the construction camps by their fellow countrymen. The same has been true of the negroes who had much rather live in the "bush" or in the cities of Panama and Colon where they are less restricted.

The residence section at Gatun. The three great twin locks near the Atlantic entrance of the Canal are located here.

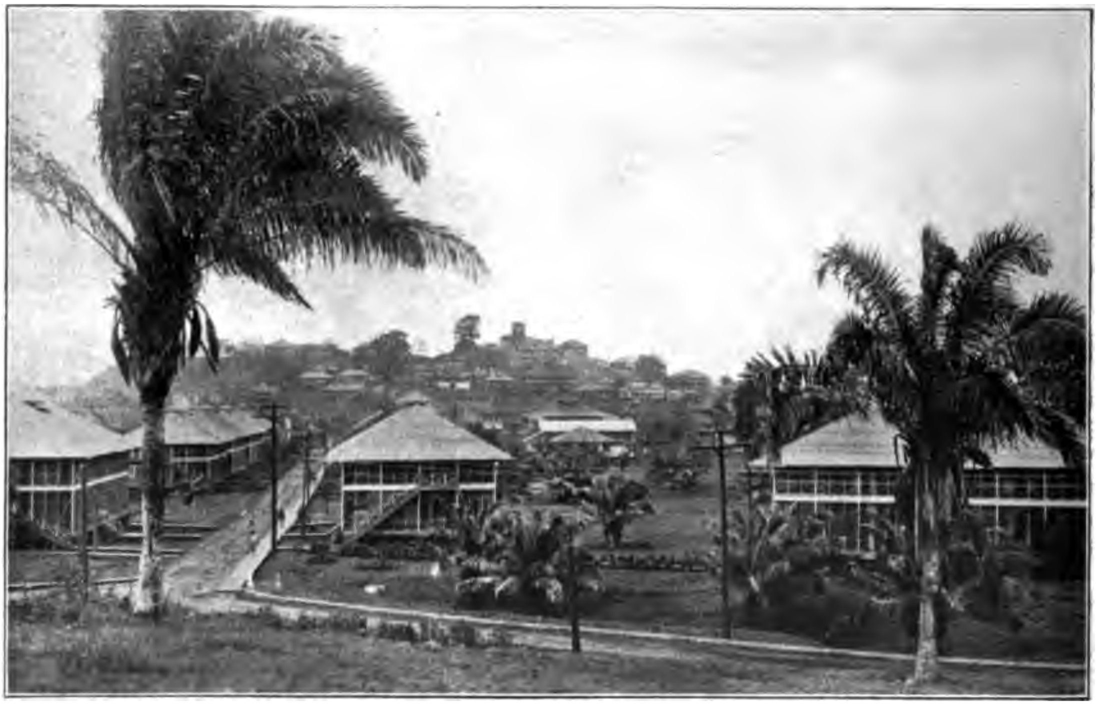
During a single year the total number of meals served in the hotels was 2,075,335; the total number of rations served in European laborers' messes was 1,108,175 and the total number of rations served in the negro messes was 584,457.

THE CANAL ZONE

The Canal Zone does not come under the Constitution of the United States, but is governed by orders made by the President or the Secretary of War, and laws especially enacted by Congress. Its official seal bears the motto, "The Land Divided—The World United," and consists of a shield, showing in base a Spanish galleon of the fifteenth century under full sail coming head on between two high banks, all purpure, the sky yellow with the glow of sunset;



A view of the town of Culebra from Mount Zion as it appeared several years ago. The buildings to the right along the edge of the Canal, have all been removed on account of the slides at this point.



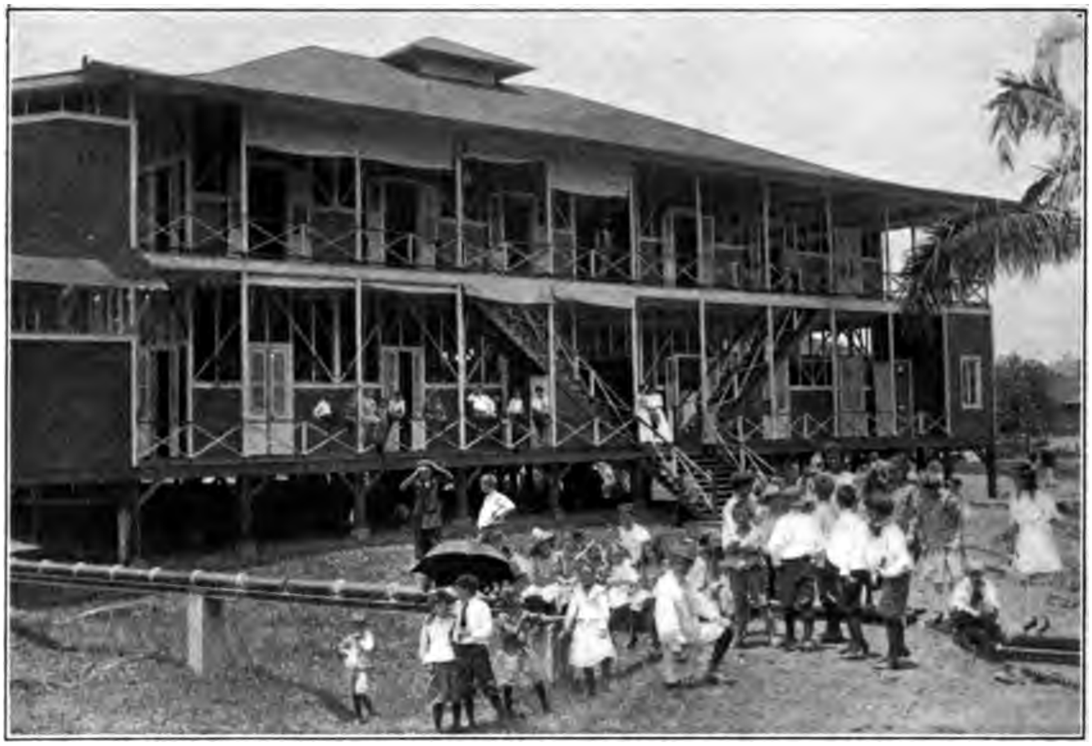
A group of four-family houses for American married employes, Empire. Large verandas are built on each side of the houses and all are screened.

in the chief are the colors of the arms of the United States. Under the shield is the motto. It was adopted in 1906 after a design of Tiffany & Co.

Up to September 1, 1904, the six municipal districts in which the Canal Zone was divided were governed under the laws of Panama. On the latter date, the Canal Commission by law created five municipal districts, each with a mayor, municipal council, secretary, and treasurer. These five municipal districts were abolished April 15, 1907, and four administrative districts were created. On November 17, 1906, the Department of Sanitation was separated from the Government of the Canal Zone, and the latter then became the Department of Law and Government of the Canal Zone under Mr. Richard Reid Rodgers, General Counsel. This department was abolished on April 2, 1907, and the authority of the chief executive of the Canal Zone was vested in the Chairman of the Isthmian Canal Commission. The Chairman, on May 9, 1907, delegated that authority to a member of the Commission, and the President, by an Executive Order dated January 6, 1906, created the Department of Civil Administration.

The Isthmian Canal Commission Chapel, Ancon. Nearly all the principal religious denominations are represented in the Canal Zone, and there are upwards of 40 places of worship. The Commission employs several Chaplains.

The work of the Department of Civil Administration, in addition to the diplomatic correspondence between the Commission and the Republic of Panama and the representatives of foreign governments in Panama, is partitioned, as follows: Posts, customs and revenues; police and prisons; fire protection, schools and the office of the treasurer of the Canal Zone. The



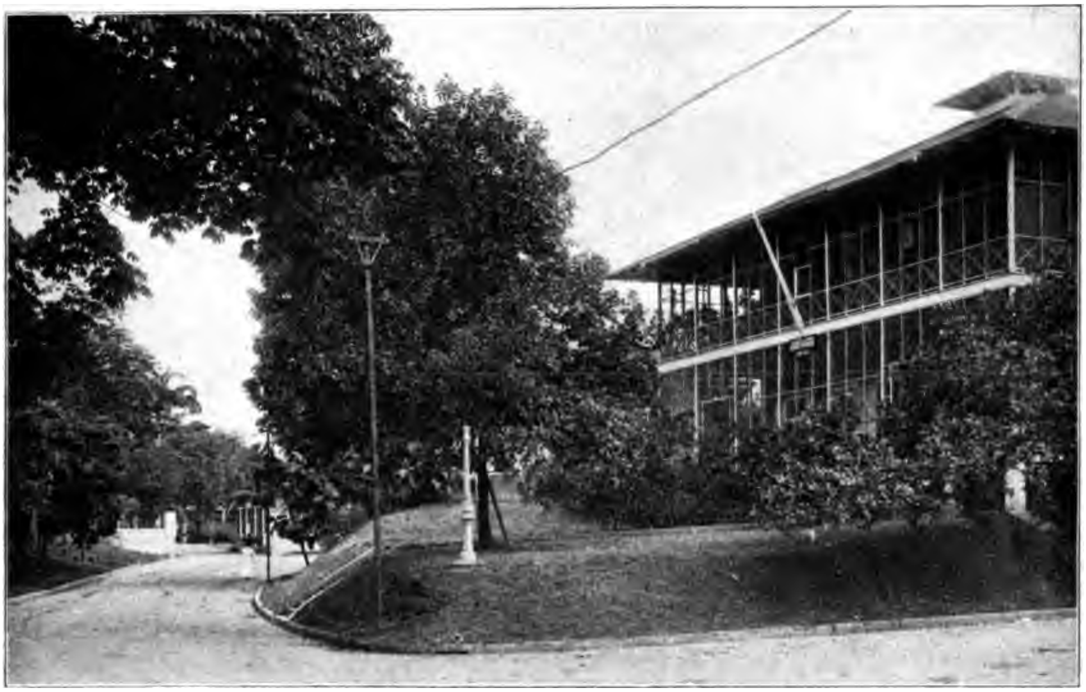
School for white children at Empire. Twelve white and fifteen colored schools are maintained. The white schools are in charge of women teachers from the United States; the colored schools are taught by male West Indians.

Ancon high school class, term of 1912-13. There are two high schools for advanced scholars.

judicial branch includes a Supreme Court, three Circuit Courts, and four District Courts. Up to July 16, 1913, the Division of Public Works, which had in charge the maintenance of streets, roads, trails, water works and sewers in the Canal Zone and in the cities of Panama and Colon, and also the public markets in the Zone, was made a part of this department. On the latter date, it became merged with the newly created Division of Municipal Engineering, under the office of the Chief Engineer.

THE POSTAL SERVICE

The Division of Posts, Customs and Revenues, as its name implies, has charge of all post-offices in the Canal Zone, the customs service at the ports of Ancon and Cristobal, and the collection of taxes and license fees. It also looks after the administration of the estates of deceased and insane employes of the Commission and Panama Railroad Company.



Post Office at Ancon. Seventeen Post Offices handle the Canal Zone mail. Postal Savings Banks are established in all but one of them.

The postal service was inaugurated on June 24, 1904, under the supervision of the Treasurer of the Zone, with Panama railroad station agents acting as postmasters in nine offices. There are now 20 offices in charge of regular postmasters appointed by the Director of Posts.

From June 24, until July 17, 1904, Panama postage stamps (which were Colombian stamps surcharged "Panama"), having the words "Canal Zone" overprinted with a rubber stamp were used. The use of this rubber stamp kept stamp collectors on the lookout for mistakes in the surcharging which would tend to make the stamps valuable. On July 17, a supply of United States stamps, surcharged "Canal Zone," was put into use and, on December 3, 1904, these were replaced by the Panamanian stamp surcharged "Canal Zone," in use at the present time. Domestic rates of postage have always applied between the Canal Zone and the United States, and for this reason the postage stamps are purchased from Panama at 40 per cent of their face value to make up the difference in the rates of the two countries, those in Panama being slightly higher.

Zone penitentiary. This was formerly located at Culebra, but was removed, along with many other buildings, on account of the slides. The offenders in the Canal Zone are kept busy building roads.

POSTAL SAVINGS BANK A POPULAR INSTITUTION

A postal savings bank was authorized by Executive Order on September 8, 1911, and became effective on November 8, 1911. At the beginning of the fiscal year there were 2,402 open accounts with deposits aggregating $356,947. The depositors include citizens or subjects of 45 different nations and dependencies. The total amount of the deposits during this period was $1,601,616, and the total amount of withdrawals $1,312,873, an increase during the year of $288,743, which, together with the amount of deposits on July 1, 1912, of $356,947, shows a total savings deposit at the close of the fiscal year of $645,690, an approximate average of $203.11 for each of the 3,179 depositors. These accounts are practically held by employes of the Commission, the Panama Railroad Company, and the various contractors. In addition to the postal savings accounts, the money orders issued and drawn on Canal Zone post-offices payable to the remitter aggregated on June 30, 1913, $156,916.20, so that the total savings deposit during the fiscal year was really $802,606.20.

In August, 1905, a registry system was established and, in June, 1906, a money order system was inaugurated. During the fiscal year ending June 30, 1913, 238,316 money orders were issued for a total of $4,883,624.13. The average amount of each order was $20.49. Of the total amount of orders sold,

$3,917,899.30 was payable in the United States and foreign countries, and orders amounting to $965,724.83 were payable in the Canal Zone.

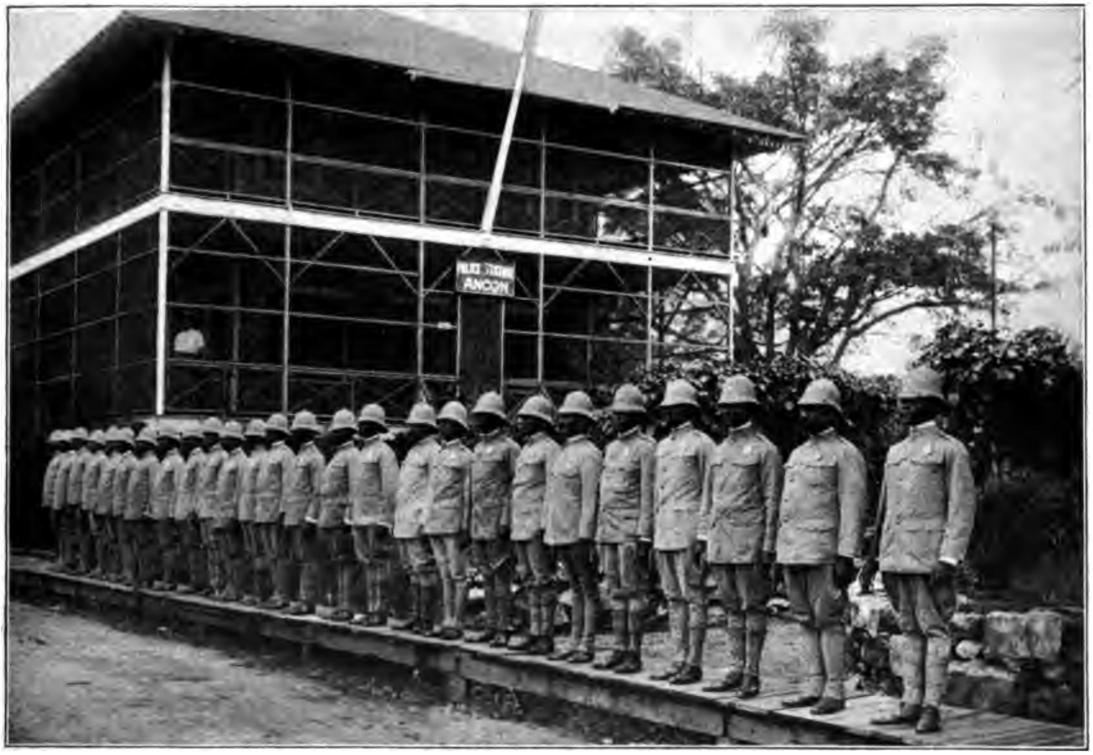
Parcels post has not yet been introduced, and there are no letter carriers and, in these respects only, is the Canal Zone system behind the service in the United States. A count of the mail matter received and dispatched or handled in transit on the Canal Zone during the month of August, 1912, showed that 30 per cent of the total was official matter.

ZONE CUSTOMS SERVICE

The customs service of the Zone includes the entry and clearance of ships at the two ports, Ancon and Cristobal, the signing on and discharge of seamen, the enforcement of the Panama Chinese, Syrian and Turkish exclusion law. No customs duties are collected, as no goods are allowed to be imported at Ancon and Cristobal, except those necessary and convenient for the construction of the Canal and for the use of employes of the Commission, fuel for sale to vessels, and goods in transit. During the fiscal year ending June 30, 1913, 281 vessels entered the port of Ancon, representing a total tonnage of 553,767, and 283 vessels cleared with a total tonnage of 556,306. At Cristobal, 280 vessels entered representing a tonnage of 849,702, and 283 vessels cleared with a total tonnage of 858,703.

THE ZONE "DRY"

Up to July 1, 1913, saloon licenses formed a large part of the internal revenues of the Zone. On that date the Canal Zone went "dry" in accordance with an order of the Commission, and 35 saloons went out of business. The



A squad of Zone policemen. The officers and first class policemen are Americans, most of whom have seen service in the Spanish-American war. The ordinary policemen are West Indians.

Central fire station at Cristobal. Fire stations are maintained at all important points, their size and equipment depending on the amount of property to be protected.

Canal Zone automobile fire engine. The department is equipped with two, one stationed at Cristobal, and the other at Ancon.

license fee was $1,200. On January 1, 1913, the distillation of liquor and the manufacture of rum upon which taxes had been levied was prohibited in the Canal Zone by Executive Order. The taxes now include a real estate rental tax, and miscellaneous license fees. Fines and costs also constitute a source of revenue.

During the year, all leases for agricultural land and building lots not covered by revocable licenses were cancelled. As the depopulation of the Canal Zone has been carried on during the past year, the amount derived from license fees has naturally decreased. The total revenues for the year ending June 30, 1913, amounted to $283,846.31. All funds thus collected are expended for local purposes. The revenues received from the postal service are applied to the maintenance of that service, and other funds are used for the support of the public school system, and for the construction and maintenance of public works.

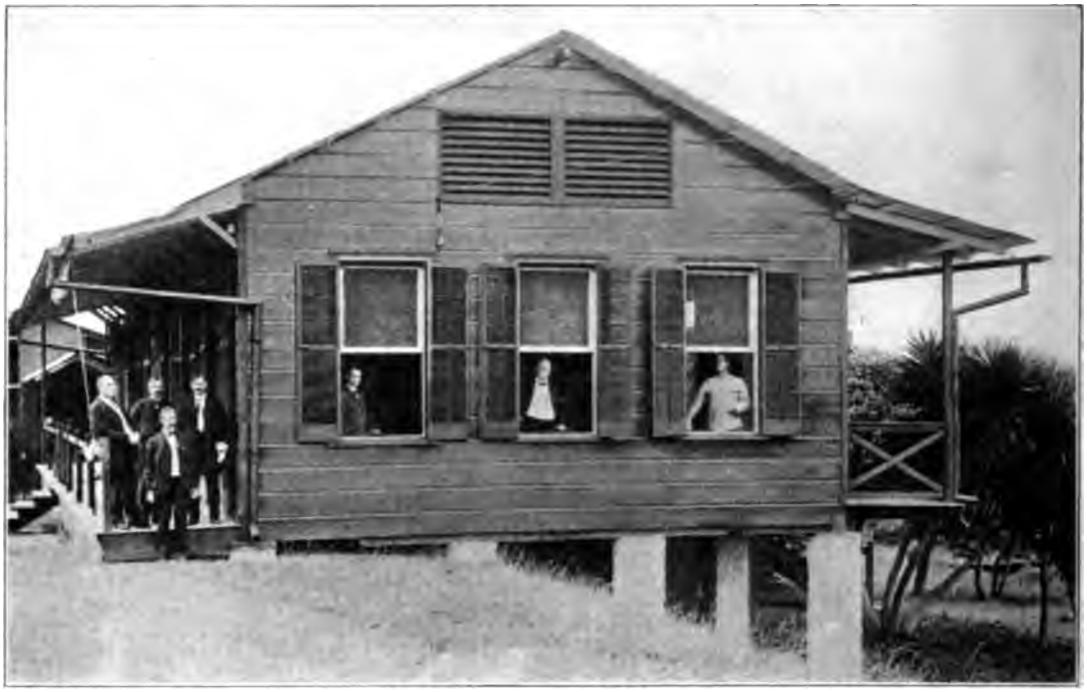
A typical pay day scene. Pay days occur once a month and the dates range from the first to the twelfth. White American employes are known as Gold Employes, and all others as Silver Employes. All are identified by the numbers on their metal checks.

KEEPING ORDER

The Division of Police and Prisons was organized on June 2, 1904. Its work has been entirely successful and the Canal Zone in which representatives of nearly every nation live and are employed is remarkably free from crime. One thing which has helped to make it a moral community is the strict enforcement of the liquor laws and regulations, the prohibition of gambling, and public prostitution. All of these vices, however, exist in the neighboring cities of Colon and Panama, with one exception of gambling. In addition to the district jails, there is also maintained a penitentiary. Police stations are located in most of the Canal Zone villages and the force is made up of white ex-army and navy men and colored police officers who have seen service in the Jamaican constabulary. All convicts as well as district prisoners work on the public roads. The work performed by the convicts in the penitentiary nearly paid the cost of guarding, subsisting and clothing them.

GUARDING AGAINST FIRES

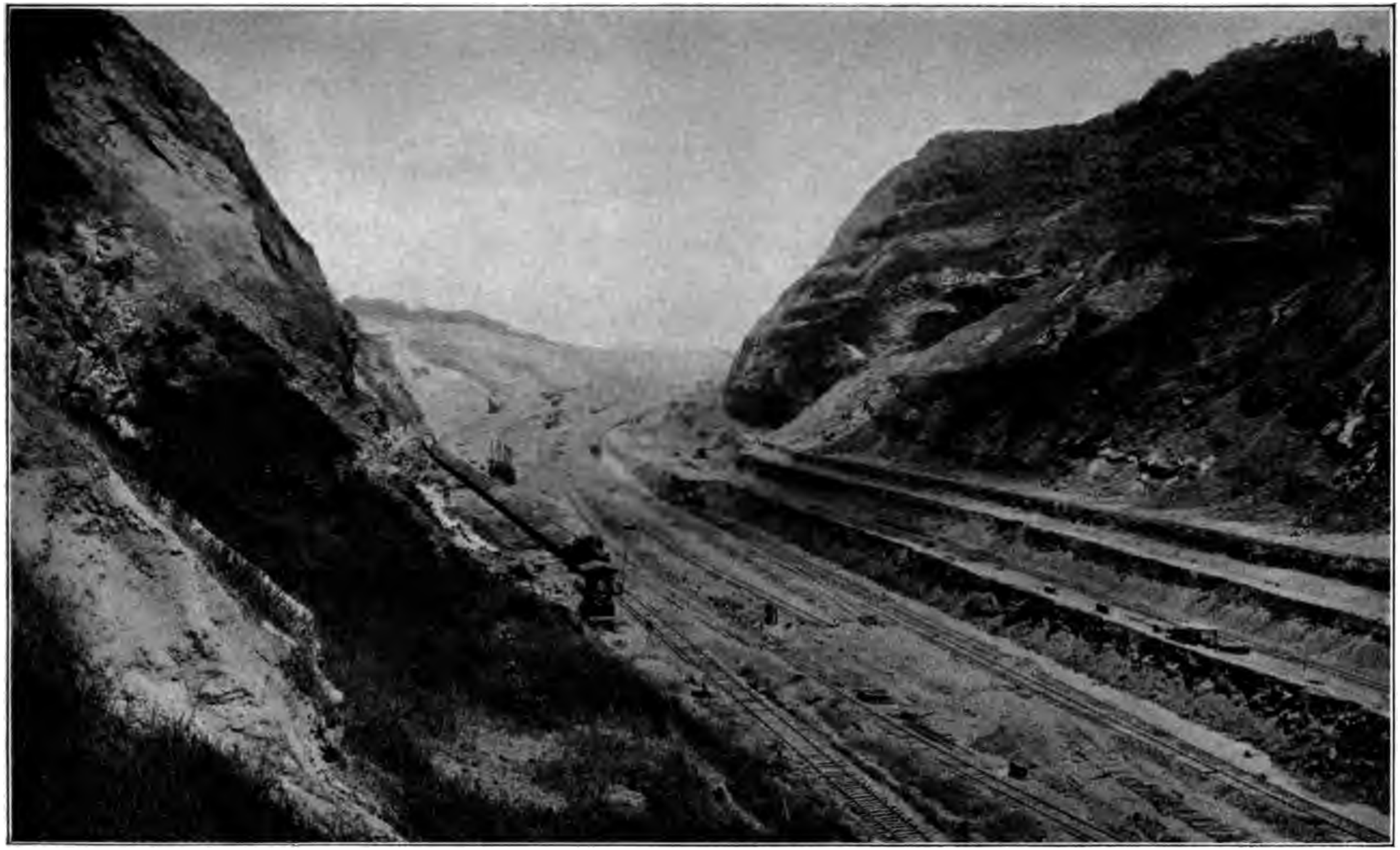
The Division of Fire Protection was organized in October, 1905, and on December 1, a fire chief was appointed. His work consisted in organizing volunteer companies composed of Commission and Panama railroad employes. In November, 1906, the first paid company, composed of experienced firemen from the States, was established at Cristobal. The organization consists of 37 firemen in addition to a chief, assistant chief, six captains, six lieutenants, and 15 volunteer companies with a total membership of 252. The equipment includes two modern automobile fire engines, one stationed at Cristobal, and the other at Ancon. The department answers alarms in Panama and Colon when property belonging to the Panama railroad or to the United States Government is in danger, or upon the request of the Panama authorities. The Canal Zone has been remarkably free from fires, but a well organized fire system is necessary, as the Government and the Panama Railroad Company do not carry insurance on their property. The largest and most expensive fire in the Canal Zone was that when the storehouse at Mount Hope burned in 1907, with a total loss of $417,548.09.



First United States Court held on the Canal Zone at Ancon.

EDUCATIONAL FACILITIES

The Zone public school system was organized in 1904, but no action was taken until December, 1905, when a census of children of school age, six years and over, was taken. The first school was opened at Corozal on June 2, 1906. There were 29 schools on June 30, 1913, fourteen for white children and 15 for colored children. The school year covers the period October 1 to June 30. A total of 1,369 white children and 1,580 colored children were enrolled in the schools at the close of the 1913 term. In the high school maintained for white pupils there were 93 students, seven of whom graduated. Children living in towns where there are no schools are provided with free railroad or wagon transportation to the nearest school town. At the close of the school year there



Culebra Cut looking north from Gold and Contractor's Hills. This great gash on the face of nature, which severs the continental backbone, has been, and probably always will be, the spectacular feature of the Canal. When the French first started work, the peak of Gold Hill was 534 feet above sea level and the greater part of excavation by steamshovels has been confined to this section.

were 47 teachers employed in the schools for white children and 32 in the schools for colored children. These teachers received monthly salaries of either $90 or $110, according to their length of service.

THE LAW DEPARTMENT

The Department of Law of the Canal Commission has charge of all of its civil cases, as well as the government of the Canal Zone. It attends to the prosecution of all crimes and misdemeanors in the Supreme and Circuit Courts of the Zone, and its head and his assistants furnish opinions when called upon to the Chairman and Chief Engineer and the various departmental chiefs. Land matters of the Commission and the Panama railroad are under the jurisdiction of the department, managed by a land agent, and in addition, the department head looks after the legal affairs of the railroad. Since the organization of the Joint Land Commission, the department has represented the interests of the United States in the adjustment of claims. Judge Frank Feuille, who has held a number of important posts in the legal departments of Porto Rico, and who was connected with the Department of State and Justice in Cuba during the administration of the affairs of that island by Judge C. E. Magoon, is Counsel and Chief Attorney for the Commission and Panama railroad. His assistants are W. K. Jackson, Prosecuting Attorney, and C. R. Williams, Assistant Prosecuting Attorney.

PAYING THE CANAL FORCE

The Department of Disbursements has charge of the disbursements of all funds in connection with the Canal work on the Isthmus.

Present Court House at Empire. The United States possesses all authority over the Canal Zone, policing the territory and holding complete judicial power.

In 1904, when only the fluctuating Colombian silver currency was available for the payment of silver employes, it was customary to advertise for this money in such sums as were required. The bid which gave the best return was accepted. The premuim paid varied from 117 on May 23, 1904, the date of the first sale, to 110 in August, 1904, and rose from then to 115 in January, 1905, the time the last sale was made under this plan. This made the old Colombian *peso* vary from $.4606 (expressed in United States values), to $.4755, it being worth $.464 at the time of the last sale. The requirements of the Disbursing Office at that time were much more limited than now, a total of $523,000 sufficing for expenditure from May 23, 1904, up to the time Panama money was introduced in March, 1905, an amount less than one-third of the total of one month's pay roll in 1913. During this period American employes exchanged a part of their gold for Colombian currency and paid their local obligations in that money, in that way netting a profit of about $7.50 gold on each $100 in gold exchanged. In other words he would get $215 silver for $100 in gold, and as local prices, board, etc., were based on silver, he was the gainer in the transaction. The situation was much simplified when the United States minted the money for the national currency of Panama, by fixing the value of the Panama *peso* at the ratio of two for one, but the profits on exchange were at once lost, for local prices immediately reverted to the gold basis, and employes who were formerly paying $50 silver for board, less the profit on exchange, then paid $25 gold flat.

The gold payments were first made in United States paper, but this was found to be both expensive and inconvenient, for the reason that the local merchants and others shipped these bills out of the country as fast as they were brought in, as they made a cheap means of exchange. On May 1, 1905, an agreement, which had previously been made by the Secretary of War with bankers in Panama City, commonly spoken of as the "Bankers' Agreement," became effective. Under this arrangement, the Commission secured from four banking firms in Panama all the United States money necessary for the work on the Isthmus upon the payment of a premium of ¾ of one per cent. This agreement expired by limitation on April 30, 1906, and was not renewed. Shipment of gold coin from the United States was then begun. On account of the export

Offices of the Disbursing Officer, and of the Examiner of Accounts, Empire.

tax imposed by the Republic of Panama on coin, either gold or silver, this money could not be shipped out to advantage as was done in the case of bills. The bankers finally announced their willingness to receive disbursing officer's checks on the New York sub-treasury at par, in exchange for gold and silver, so that shipments of gold from the United States to the Isthmus grew less and less, and for a time ceased altogether. For a long time American employes were paid their salaries solely in gold, but with the increase in circulation of paper on the Isthmus due in part to the increase in tourist trade, and in part to the resumption of paper shipments from the United States, they are now frequently paid in bills.

A Commission brake, used in carrying children to and from school. The Canal Commission lends every aid to the cause of education in the Canal Zone. When necessary to use the railroad, passes are given the pupils.

Silver employes were paid semi-monthly up to and including September, 1907, as they were unable to get credit from the Chinese merchants, from whom they made their purchases, for more than two weeks at a time. With the opening of the commissaries and laborers' kitchens, and the privilege accorded laborers of procuring commissary books and meal tickets to be charged against their time, the necessity for a double pay day each month ceased to exist, and since then there has been but one pay day monthly. Two pay offices are maintained, one at Ancon, and the other at Cristobal, and, in addition, a pay car visits all parts of the work each month. The pay day period ranges from the 1st to the 12th.

At the outset some criticism developed over the lapse of time between the close of the month and the pay day for employes. This led to an investigation of practices in vogue in making payments by large employers of labor. The pay envelope method was found impracticable, likewise the signature pay roll method, although this system was tried for a month in 1905. The system finally adopted and still in use, consists of certificates made out for each individual payment, duly checked and authenticated. This certificate when properly signed by the payee and witnessed by an employe who is bonded for that purpose, and presented by the payee on the pay car, or at one of the pay offices, is immediately paid the amount called for thereon.

During the fiscal year ending June 30, 1913, a total of $20,524,705.75 was disbursed on the Isthmus for salaries and wages, $9,228,633.99 to gold employes of the Commission, and $11,296,071.76 to the silver employes, an average of $1,710,392.14 a month. Public bills and reimbursement vouchers paid on the Isthmus aggregated $9,035,630.18, making a grand total of $29,560,335.93 disbursed. During the same period, miscellaneous collections were deposited with the Treasurer of the United States at Washington to the amount of $3,940,102.82. The value of the hotel books issued by this department during the fiscal year 1912-13, was $1,305,405 in $4.80 and $15 denominations.

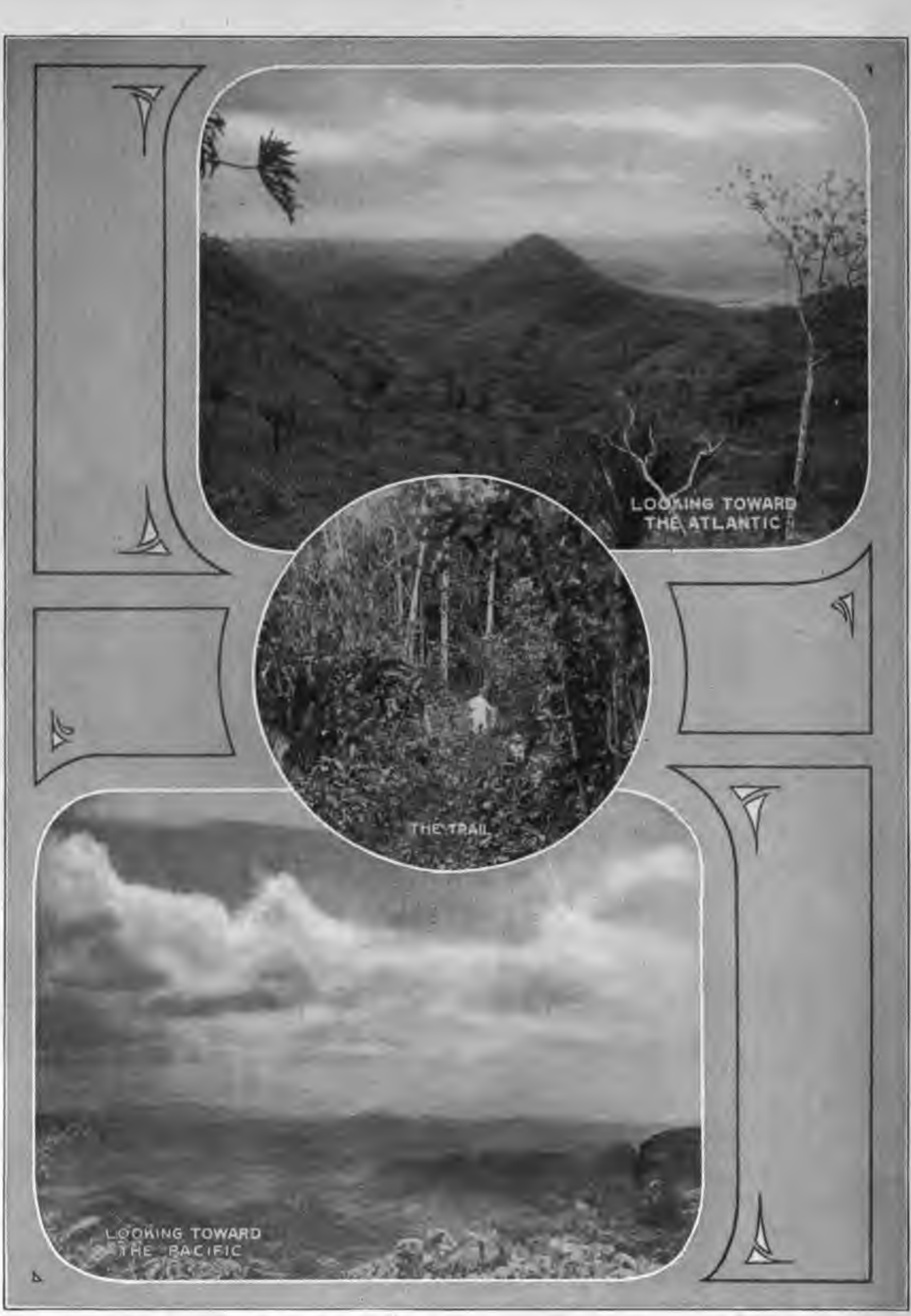
The first disbursing officer was Lieut. Mark Brooke, who temporarily disbursed funds from an amount borrowed from the director general of the French Canal Company, as when the Americans took charge on May 4, 1904, there was not a cent with which to pay bills. He was succeeded by Paymaster Eugene C. Tobey of the United States Navy, who was later relieved by Paymaster George C. Schafer, also of the Navy. On November 23, 1905, Mr. Edward J. Williams was appointed to the position, and under him the present organization was largely perfected. Mr. Williams resigned on August 30, 1913, and was succeeded by Mr. James H. McLean.

ACCOUNTS

The Department of Examination of Accounts is charged with the handling of the general accounting, pay rolls, vouchers, coupon books and meal tickets, files and bonds, injury claims, contract laborers, time inspection, timekeeping, Canal Zone accounts, and inspection of accountable officers. The major portion of the funds of the Canal Zone are on deposit in Washington, with the exception of $100,000 deposited with a local bank, and on June 30, 1913, amounted to $2,168,339.62. Consideration of injury claims is one of the most important items of the department's work. A total of 7,270 claims for compensation for death or injury were handled from August 1, 1908 to June 30, 1913. Of the 1,850 cases disposed of during the last fiscal year (1912-13), 1,452 claims for injury, and 21 death claims, were granted. The total value of these claims, inclusive of grants made on account of meritorious sick leave, aggregated $224,071.72. The average duration of disability of cases for which injury compensation claims have been filed is 58 days, and the average estimated duration of cases in which meritorious sick leave has been granted is five days. During the period from August 1, 1908 to June 30, 1913, a total of $915,824.79 has been paid on account of injuries received by employes in course of employment.

NO GRAFT

One of the first questions a visitor to the Isthmus asks is, "How much graft has there been?" A good many are inclined to be skeptical when told that there have been no cases of graft on this job, and that the would-be grafter has had but little opportunity to exercise his gift during the greater part of the canal period. It is to be supposed that the word is referred to in its larger sense



Balboa Hill is three hours' journey from Gorgona over a well-marked trail. From its top, a height of about 1,000 feet, both oceans may be seen on a clear day. The author is standing on The Trail which leads up the hill.

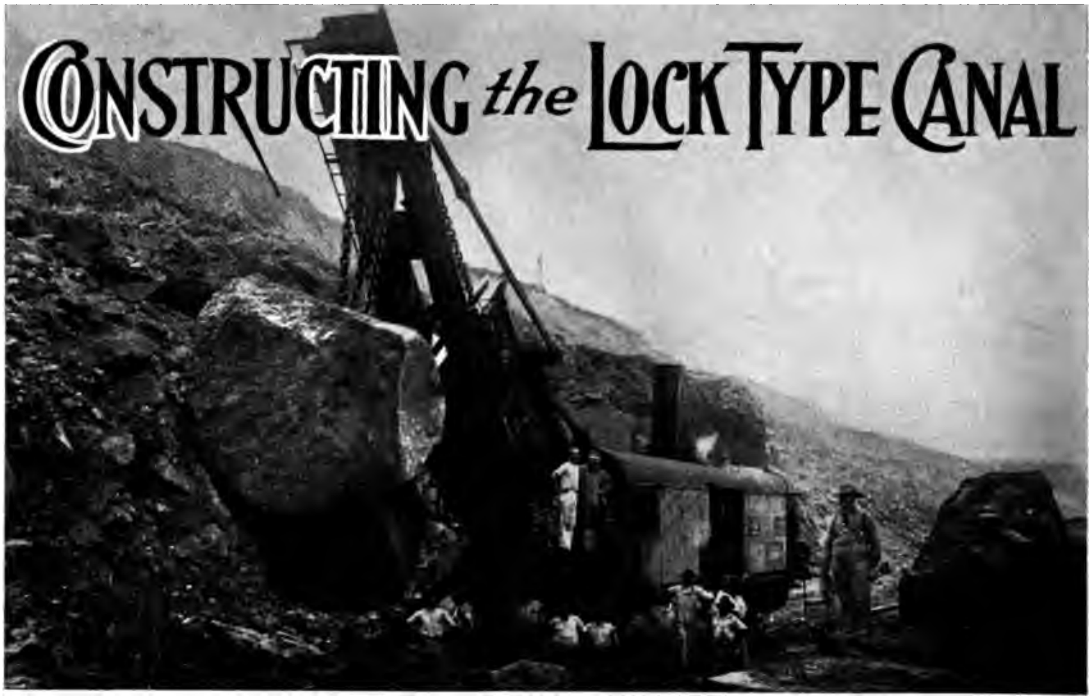
when it is said there has been no graft. There have been instances where silver foremen were charged with using their power of place by discharging some laborer who refused to give him money. In many of these cases, the charges proved to be unfounded, and, as it developed, were actuated by spite. There is no authenticated case, however, in the nearly ten years of canal work, where a case of graft with the hope of great gain in view, has been disclosed. The work is too open and above board.

It would not be accurate to say that in the early days of the work, when there were no time inspectors on the job, or other safeguards imposed, there were no opportunities. But as far as the Commission employes then were concerned, they, for the greater part, regarded themselves as being placed on their honor, and the idea held. As the force was enlarged, it became more diversified in character and temperament, and elements were introduced that required watching, not for any big forms of graft, but for the milder forms, such as malingering, or more plainly speaking, loafing on the Government's time. Thus was ushered in the era of the "gumshoes," as the Commission time inspectors are generally known.

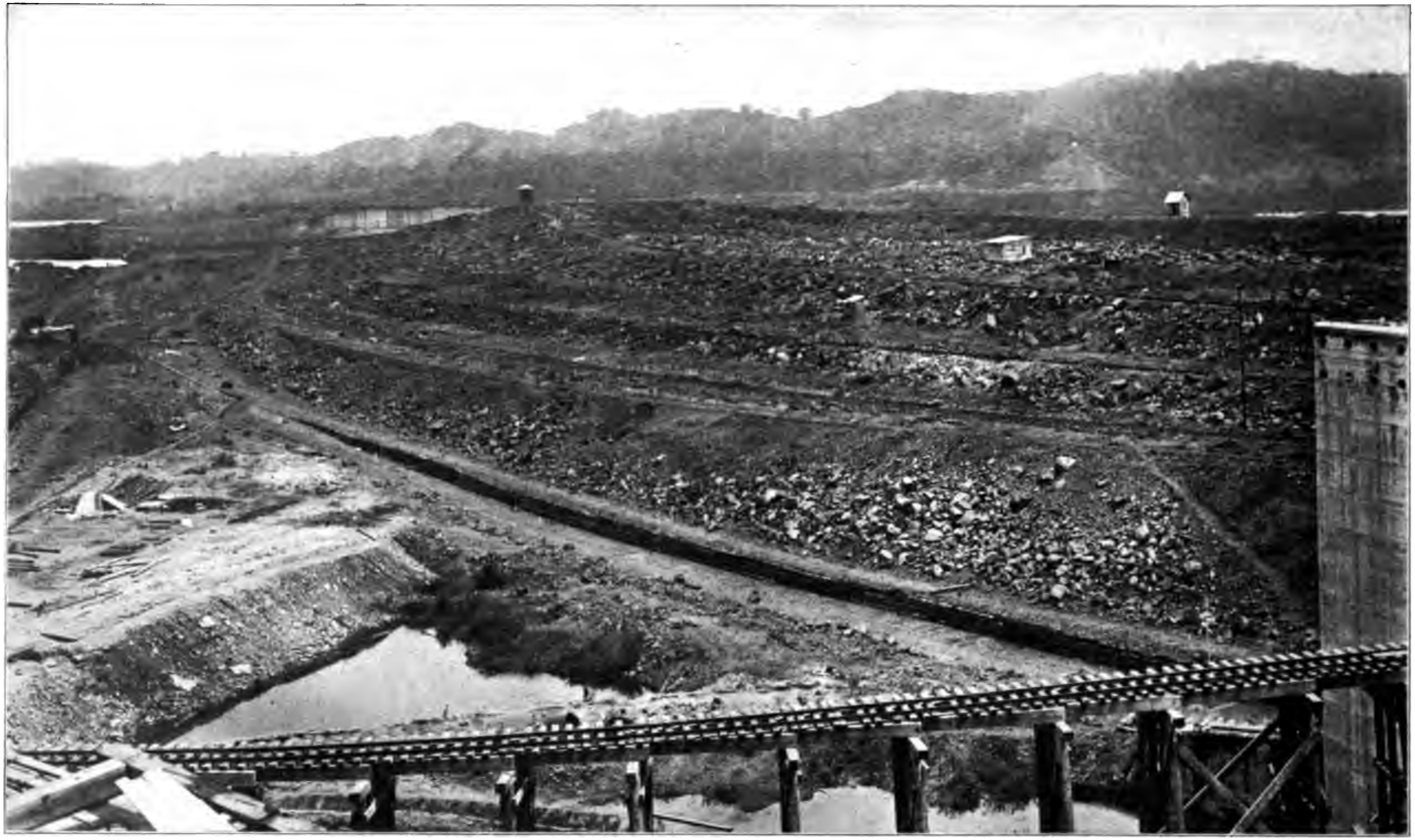
The American visitor, however, when he alludes to graft refers to the pulling off of some big deal in which the Government has been "worked" to a frazzle. The Government, represented on the Isthmus by the Canal Commission, has never been successfully "worked," or have there been any big "rake-offs." Of course, there have been plenty of cases of plain thievery, and other forms of petty crime aimed at cheating or robbing the Government, but these have been dealt with by the law, and usually the offenders have been punished severely, for to steal from Uncle Sam is almost equivalent to murder in the second degree.

Stories have been told, although the writer does not vouch for their authenticity, how some collectors on the Panama railroad during the beginning of canal construction made immense sums and were able to retire to a life of independence and ease, a state that their length of service and previous salary would scarcely warrant. The strings have been drawn much closer since then, and the opportunities for mulcting the railroad have grown beautifully less. As concerns the canal work, however, the amount of grafting has always been a negligible quantity, and this fact will forever be one of the biggest things about this big undertaking.

CONSTRUCTING *the* LOCK TYPE CANAL

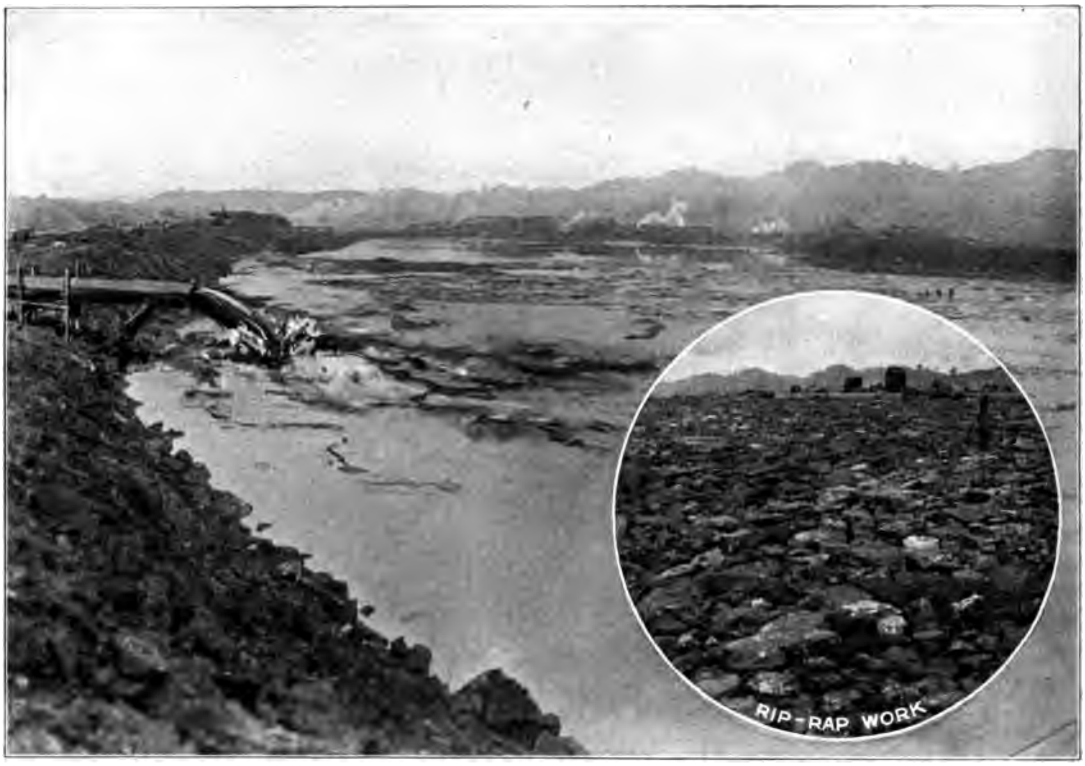


THE idea of a lock and lake level canal was not a new one, for it was first suggested in the engineering congress convened in Paris in 1879, at which the French adopted the sea level plan. At this congress, Godin de Lepinay outlined the essential features of the canal as it is today, a lake level with a dam across the Chagres at Gatun. Again, when it became evident in 1887 that the sea level canal could not be completed by the old French Canal Company, a temporary lock plan was adopted. When the United States took over the work in 1904 no plan had been determined upon. To decide this question, ex-President Roosevelt, under date of June 24, 1905, created an International Board of Consulting Engineers, consisting of 13 members as follows: Gen. George W. Davis, Chairman, Alfred Noble, one of the constructing engineers of the Soo canal; William Barclay Parsons, engineer of the New York underground system; William H. Burr, professor of engineering in Columbia college; Gen. Henry L. Abbott, army engineer, whose observations on the topography and characteristics of the canal territory were valuable; Frederic P. Stearns, hydraulic engineer of Boston; Joseph Ripley, at one time chief engineer of the Soo canal, and afterwards employed by the Isthmian Canal Commission as lock expert; Herman Schussler, Isham Randolph of Chicago Drainage Canal fame; W. Henry Hunter, chief engineer of the Manchester ship canal, representing the British Government; Eugen Tincauzer, chief engineer of the canal at Kiel, representing the German Government; Adolphe Guerard, civil engineer, representing the French Government; Edouard Quellennec, consulting engineer of the Suez Canal, and J. W. Welcker, engineer and constructor of the North Sea canal, representing the Holland Government. This board, on January 10, 1906, submitted two reports, a majority report, signed by eight members of whom five were the representatives of foreign governments, favoring a sea level canal, and a minority report, signed by five members, all of whom were Americans, and in



One of the impressive features of the work is Gatun Dam, which impounds the water required for the operation of the Canal from Gatun to Pedro Miguel. It is so constructed as to form the connecting link in the range of hills, which, excepting at this one point, encircle the low-lying valley of the Chagres River. The Dam is one-half mile wide at the base, 400 feet wide at the 85-foot lake level, and 100 feet wide at the top. It is one and one-half miles long, but only one-fifteenth of its length is subjected to the full head of 85 feet of water. The top of the Dam is 105 feet above sea level, or 20 feet above the normal lake level.

favor of a lock canal. These reports were submitted to the Isthmian Canal Commission for consideration and the latter made a report to the Secretary of War on February 5, 1906, in which all of its members with the exception of Civil Engineer Endicott, U. S. N., favored the lock plan. Mr. Stevens, at that time chief engineer, submitted a statement in favor of the lock plan, and the Secretary of War in his letter of transmittal of the reports to the President also favored it. On February 19, 1906, President Roosevelt submitted these various reports to Congress, together with a letter of recommendation in which he said:



The hydraulic core, or water-tight portion of the Dam, together with the two outer walls, or toes. The toes are 1,200 feet apart at the base, and the space between is filled with an impervious mixture of sand and clay sucked up and pumped in by dredges from the old bed of the Chagres River. The toes were brought together at the top where they cap the fill. The entire Dam contains about 21,000,000 cubic yards of material, equally divided between dry and wet fill. The upstream side is riprapped above the water level to minimize wave action.

"A careful study of the reports seems to establish a strong probability that the following are the facts: The sea level canal would be slightly less exposed to damage in the event of war, the running expenses, apart from the heavy cost of interest on the amount employed to build it, would be less, and for small ships the time of transit would probably be less. On the other hand, the lock canal at a level of 80 feet, or thereabouts, would not cost much more than half as much to build and could be built in about half the time, while there would be very much less risk connected with building it, and for large ships the transit would be quicker; while, taking into account the interest on the amount saved in building, the actual cost of maintenance would be less. After being built it would be easier to enlarge the lock canal than the sea level canal. Moreover, what has been actually demonstrated in making and operating the great lock canal, the Soo, a more important artery of traffic than the great sea level canal, the Suez, goes to support the opinion of the minority of the Consulting Board of Engineers and of the majority of the Isthmian Canal Commission as to the superior safety, feasibility, and desirability of building a lock canal at Panama."

Congress on June 29, 1906, decided upon a lock canal at an elevation of 85 feet. That this was the best plan to pursue has been proved by experience with slides which added greatly to the estimated amount of excavation necessary under either plan.

THE CANAL A WATER BRIDGE

The completed canal is virtually a water bridge over which ships will pass from ocean to ocean. There was no mating of the Atlantic with the Pacific when the dike at Gamboa was destroyed on Friday, October 10, 1913, and the waters of Gatun Lake were allowed to flow into Culebra Cut, for lake and Cut are, at the surface of the water, 85 feet above the level of the sea. From deep water in the Atlantic to deep water in the Pacific the Canal is about 50 miles long; from shore line to shore line it is about 40 miles long. It does not, as is quite generally thought, cross the Isthmus from east to west. Its general direction is from northwest to southwest, and the city of Panama at the Pacific entrance is about 22½ miles southeast of Cristobal at the Atlantic entrance.

Early subsidence in Gatun Dam. This occurrence caused the sensational stories in the newspapers in the United States in 1908, to the effect that the Dam had sunk and that the foundation was unsuitable for such a massive structure. The completed Dam demonstrates that the statements were entirely unfounded, and that it is as effective a water barrier as the age-old hills upon which it abuts.

Starting in the Atlantic, a vessel enters a sea level channel 500 feet wide to Gatun, a distance of seven miles, where it will be lifted by a flight of three locks, or immovable water elevators, having a combined lift of 85 feet, to the level of Gatun Lake. The lake proper to Bas Obispo, the beginning of Culebra Cut, the man-made pass through the continental divide, is about 24 miles long, and the channel through it varies from 1,000 to 500 feet in width, with a water depth

Experimental spillway at Gatun Dam. Like all other important features of the Canal work, experiments were made to ascertain the proper method of constructing the work.

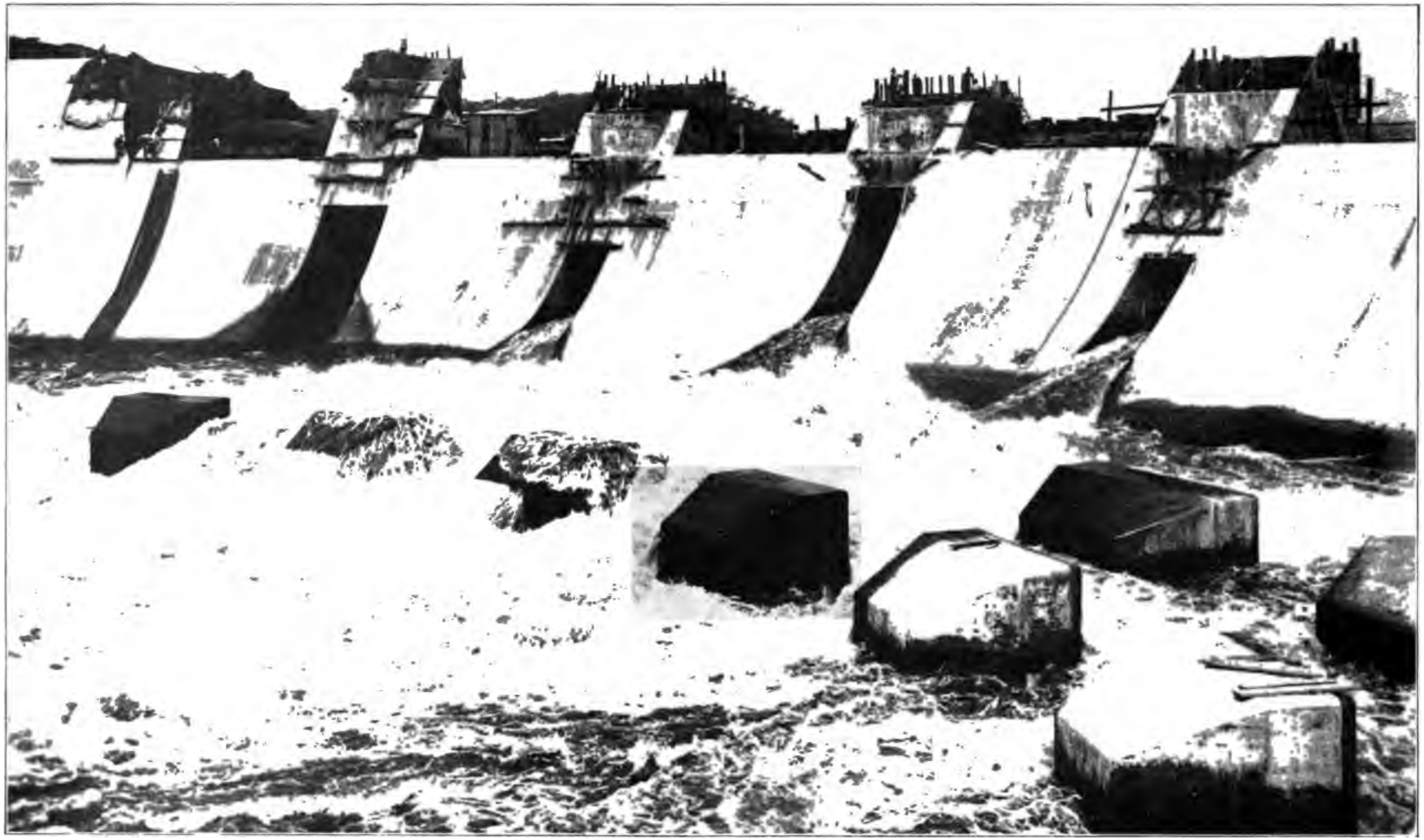
Gatun spillway, looking from the lake. The spillway is a concrete lined opening, 1,200 feet long, 285 feet wide and is situated about midway of Gatun Dam.

from 85 to 45 feet. While in the lake a vessel may steam at full speed. The channel through Culebra Cut as far as Pedro Miguel, nine miles, narrows to 300 feet, the minimum bottom width of the Canal. At Pedro Miguel, the vessel is ready to begin the descent to the Pacific. There is a single lock here, which lowers the vessel 30½ feet to a small artificial body of water called Miraflores Lake, which is about 1½ miles long and 54⅔ feet above sea level. The final descent to sea level is made at Miraflores by a flight of two locks. The vessel has now passed over the bridge, and is ready to proceed through a sea level channel 8½ miles to deep water in the Pacific. This channel, like the one on the Atlantic side, has a bottom width of 500 feet, but its depth is 45 feet at mean tide, instead of 41 feet. This difference in the depth of the two sea level approaches is due to the fact that it is necessary to partly counteract a maximum tidal oscillation in the Pacific of 21 feet; that in the Atlantic is but 2½ feet; the mean sea level is the same in both oceans.

THE DAM AT GATUN

When plans for a sea level canal were under consideration, one of the hardest problems to solve was the diversion of the Chagres River. Now, however, with a lock canal, the Chagres is the key to the situation. By placing a dam across the lower end of its valley, its water and that of its tributaries have been impounded to form Gatun Lake. The dam is, in reality, a low ridge of earth connecting the hills on either side of the valley, and looks as though it had been placed there by nature rather than by the efforts of man. It is 1½ miles long, 105 feet above mean sea level, or 20 feet above the normal level of the lake, and tapers from nearly ½ a mile wide at its base, to about 100 feet wide

Water from the lake flowing over the spillway, during the rainy season, before it was completed. The spillway will control the rise and fall of Gatun Lake.

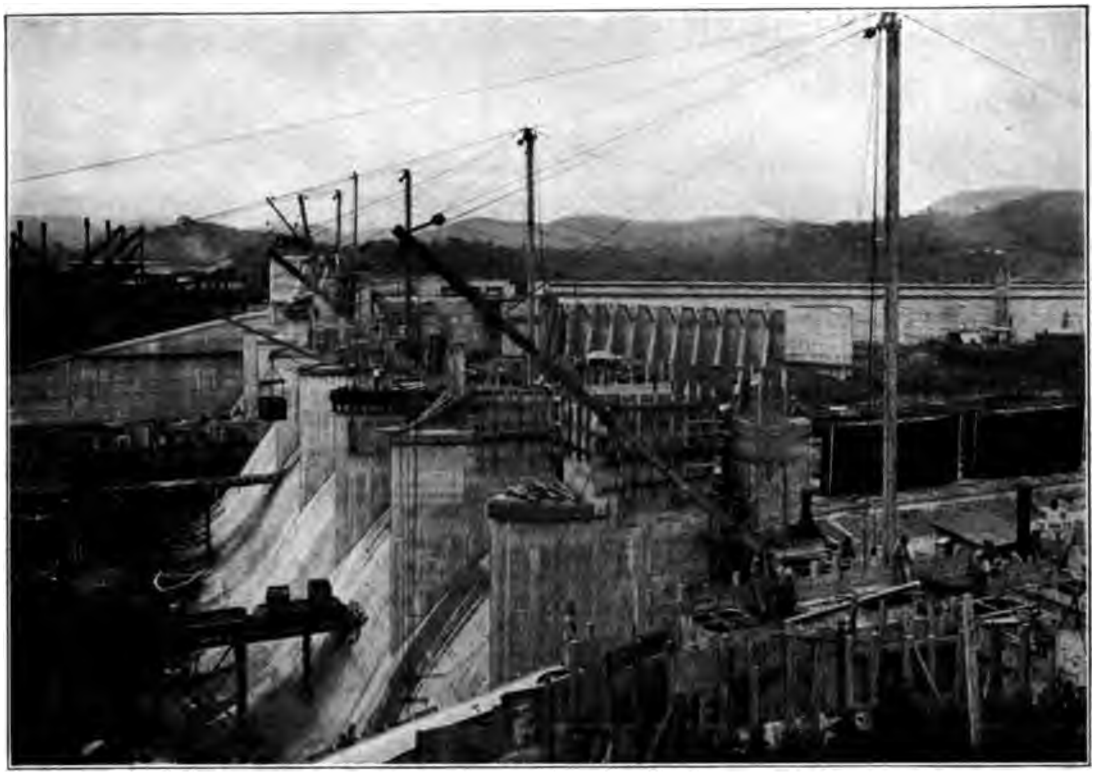


The spillway from the down stream side. A concrete dam, semi-circular in form, has been built across the head of the spillway channel, and on its crest at 69 feet above sea level, concrete piers, spaced 45 feet apart have been built, between which there are steel gates which may be opened or closed to control the lake level.

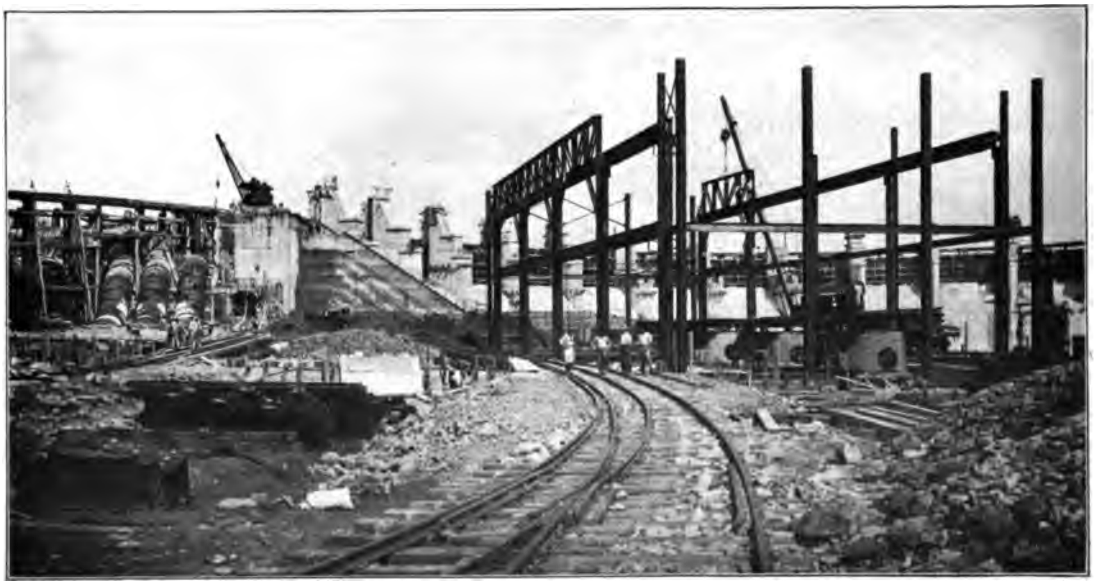
at the top. It was constructed of material taken from the Canal amounting to about 21,000,000 cubic yards. The method of construction consisted in building up two parallel ridges or toes of earth riprapped with rock. Between these two ridges, suction dredges pumped sand and clay mixed with water from the bed of the Chagres river. As the water drained out of this interior fill, the clay mixture dried and hardened and formed an impervious core.

In November, 1908, a portion of one of the rock toes sank into the silt and soft mud deposited in the bottom of the old French Canal Channel which passed through the site of the dam. This had been anticipated by the engineers on the Isthmus, but at the time it led to sensational stories in the newspapers in the United States, to the effect that the dam had sunk and that the foundation was unsuitable for such a massive structure. To allay the fears aroused, President Roosevelt sent a special board of consulting engineers to the Isthmus to make an examination of the work in progress, and particularly of Gatun Dam. This engineering board, consisting of Frederic P. Stearns, Arthur P. Davis, Henry A. Allen, James D. Schuyler, Isham Randolph, John R. Freeman, and Allen Hazen, reported on February 16, 1909, that: "The design upon which work on the dam is now being prosecuted abundantly fulfills the required degree of stability and goes far beyond the limits of what would be regarded as sufficient and safe in any less important structure." It also recommended that the height of the dam as originally proposed be reduced 20 feet.

The overflow from the spillway passing out through the old bed of the Chagres River into the Atlantic Ocean. With the lake at its maximum elevation of 87 feet, the regulating gates in the spillway will permit of the discharge of a greater volume of water than the known maximum discharge of the Chagres River during a flood.



Miraflores spillway, completed September 1, 1913. Lies between Miraflores Locks and rising ground to the east, and forms Miraflores Lake. It also regulates the level of the lake.



Hydroelectric station, Gatun spillway, under construction, showing location of penstocks.

The completed dam has demonstrated the fact that it is as effective a water barrier as the age-old hills upon which it abuts.

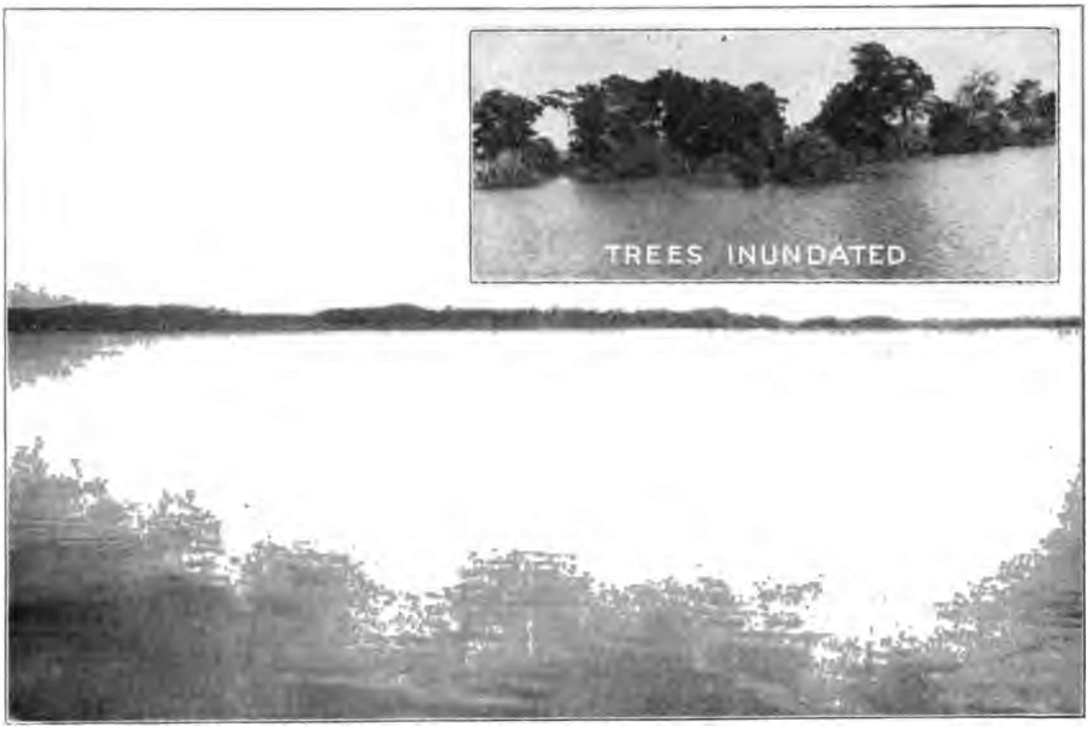
GATUN SPILLWAY

In order that the lake will not rise above 87 feet and reach the point where it would flow over the crest and endanger the dam, a spillway has been constructed through a rock hill nearly in its center. This is a concrete-lined channel 1,200 feet long and 285 feet wide, 10 feet above sea level at the lake end and sloping to sea level at the foot. At the lake end a concrete dam has been built in the form of a crescent 808 feet long, closing the 285-foot channel. This dam is 69 feet above sea level, or 16 feet below the normal level of the lake, and at its top there are 13 concrete piers between which there are mounted 14 electrically operated gates to control the flow of water. The piers and the gates bring the height of the spillway dam to 115.5 feet above sea level, or 30.5 feet above the lake level. With these gates open the spillway will be able to discharge as high as 140,000 cubic feet of water per second, a larger amount than the maximum known discharge of the Chagres during a flood.

GATUN LAKE

The lake which covers an area of 163.38 square miles and contains about 183 billion cubic feet of water, saved excavating a 24-mile channel to the beginning of the cut through the continental divide at Bas Obispo. It also makes the Chagres River a most important factor in the success of the project, rather than a torrential stream that would otherwise be a menace to the Canal. The lake has a coast line of about 1,016 miles, and only about 90 square miles

The penstocks at the new hydroelectric station at Gatun spillway, which, by furnishing the water to the turbines from Gatun Lake, will drive the machinery at all the locks.

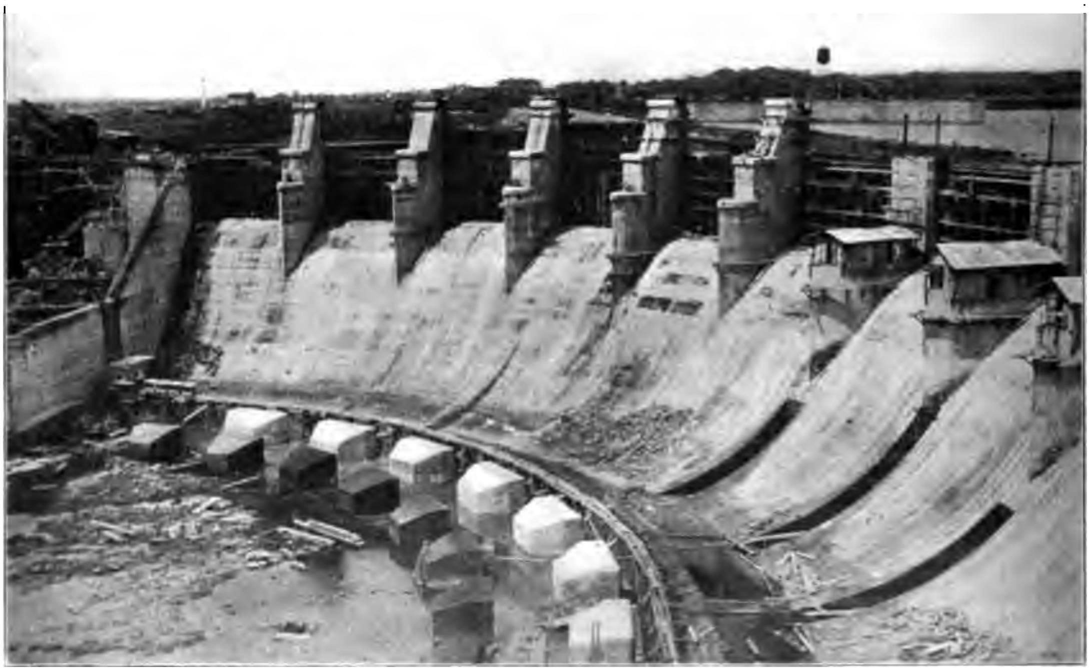


View of Gatun Lake. The lake is formed by Gatun Dam, and receives the flow of the Chagres River, and several smaller streams. At its maximum height of 87 feet, it will inundate 167.4 square miles of territory, part of which lies in the Canal Zone, and part in the Republic of Panama. It will have a coast line of 1,016 miles, and will be the largest artificial body of water in the world. It covers a broad expanse from Gatun to Bas Obispo, thence is confined to the 300-foot channel in the Culebra Cut section to Pedro Miguel. During the dry season—December to May—the lake will remain about stationary, while in the rainy season, there will be a surplus. Thousands of acres of trees and jungle growth are being inundated by the rising waters of the lake.

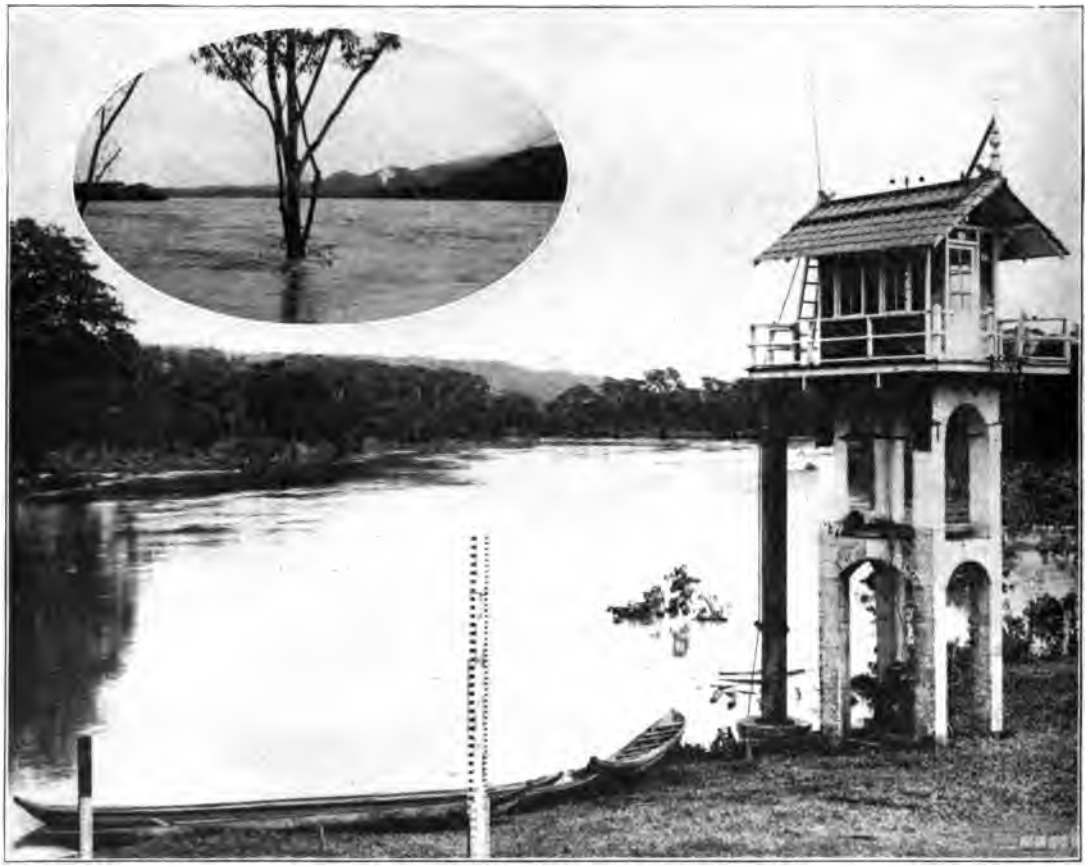
Floating islands in Gatun Lake. These are really masses of vegetation detached from the swamps by the rising waters and carried out by winds into the open water. Some of them cover half an acre in extent, and have given considerable trouble by obstructing the lock entrance.

of its total area is within the Canal Zone. In the rainy seasons the lake will be allowed to rise to 87 feet above sea level, and thus provide a surplus for the three or four months of the dry season when the run-off of water in the Chagres basin is low. Allowance has also been made for evaporation, seepage, leakage at the lock gates, and power consumption. With the lake at 87 feet there will be stored a little over five feet of water. That is, the lake could be lowered five feet without reducing the depth through Culebra Cut below that in the approach channel on the Atlantic side. Extensive studies over a period of many years of the rainfall and the amount of water that will flow into the lake from the Chagres River and its tributaries during the rainy seasons indicate that there will always be a sufficient supply for navigation of the Canal.

The Chagres River rises in the mountains east of the Canal, is about 160 miles long, and drains a watershed 1,320 square miles in extent. Above Bas Obispo its rise is very rapid and, as it ascends, it flows through deep and narrow gorges causing a very rapid run-off of the rains, and the river has been known to rise a little over 25 feet in 24 hours. As it winds in and out of the hills in its upper reaches rapids become more numerous and difficult for the passage of the native *cayucos* or canoes, the only means of navigation. Going up the river only the native boatmen, adept from long practice in poling their boats, can successfully negotiate the rapids. Above Alhajuela, the river is bordered by limestone cliffs into which the water has for ages been eating its way, forming caves and underground water courses. The towering cliffs are covered with a mass of vines and creepers wound about the trees, which have in some way found room for their roots, all covered with bright and vari-colored blossoms.


The spillway Gatun with the sluice gates closed. Locks and village of Gatun in the distance.

One of the bends in the upper Chagres River. The Chagres is the principal feeder of Gatun Lake. It rises in the mountains of interior Panama and drains 1,300 square miles of territory. During the dry season it is a quietly flowing stream, but in the rainy months it is subject to sudden freshets, bringing down a great volume of water, which, during the year 1910, equaled one and one-half the volume of water that will be contained in Gatun Lake.



To the right of this picture is shown a gauging station, one of three maintained on the river. Accurate records are kept of the river stages as well as of the rain fall. The Isthmus has two seasons; wet and dry. The greatest recorded rain fall on the Isthmus for 24 hours is 10.86 inches; for one hour 5.86 inches and for 3 minutes 2.46 inches. The small picture above shows the river during one of the floods.

Excavating for lock site, Gatun.

Excavating for lock site, Pedro Miguel.

Excavating for lock site, Miraflores. Millions of cubic yards of material had to be excavated before the locks were built.

The swift moving river, the brilliant tropic foliage, and the towering cliffs, all tend to belie the Isthmian poet Gilbert's lines that:

"Beyond the Chagres River
'Tis said (the story's old),
Are paths that lead to mountains
Of purest virgin gold;

But 'tis my firm conviction,
Whate'er the tales they tell,
That beyond the Chagres River,
All paths lead straight to hell."

The Chagres has two principal branches, one (the larger), known as the Pequeni, rising in the San Blas mountains, very close to the Atlantic coast, and the other the Indio River. Between Bas Obispo and Gatun, it has 26 branches, the largest of which are the Gatun and Trinidad rivers. In the dry season these tributaries may be regarded as negligible, but during the rainy months they, like the main river, become tropic torrents, with a volume not to be ignored. However, such floods or freshets, which are of frequent occurrence in the rainy season, would have but slight apparent effect on the lake, for it would take the greatest known flood of the Chagres nine hours to raise the level of the lake one foot. The smallest run-off of water in the basin during the past 22 years, as

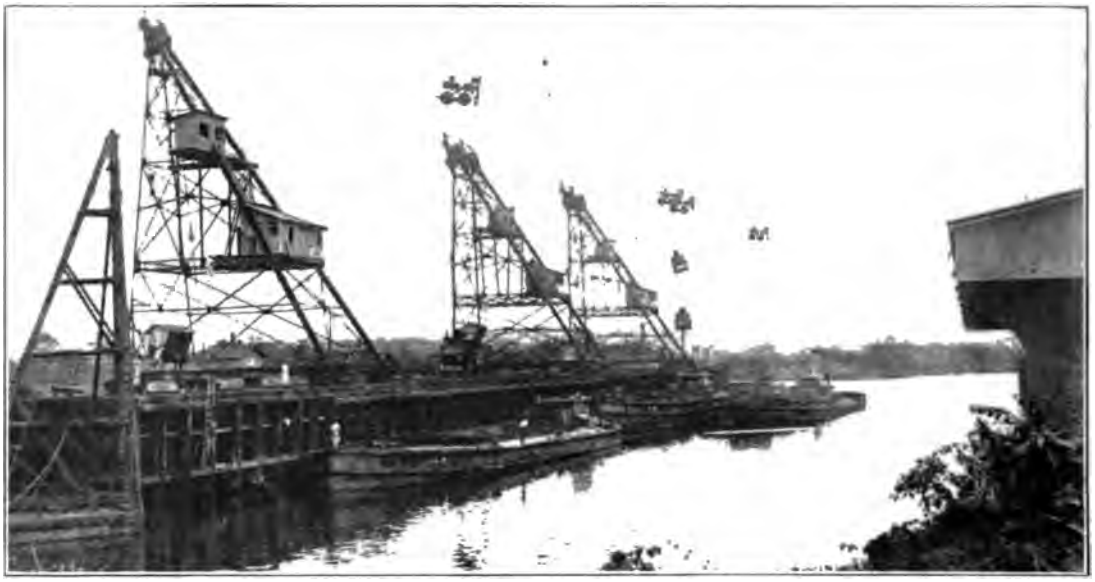
It was necessary to go 17 miles along the Atlantic coast to get the proper grade of rock for the concrete used in Gatun locks. Large rock for the Colon breakwater was also obtained here. This shows the rock quarry, crushing plant, and the American settlement established there on account of quarry operations. The crushed rock was loaded in barges and towed to Gatun. Sand for the concrete used at Gatun locks was obtained at Nombre de Dios, about 35 miles along the coast from Colon, and was also towed to Gatun in barges. Porto Bello, signifying "Beautiful Port," is the best haven on the Atlantic Coast of Panama.

measured at Gatun, was that of the fiscal year 1912, which was about 132 billion cubic feet. In 1910, the run-off was 360 billion cubic feet, or a sufficient quantity to fill the lake one and a half times.

The rainy season is from May to December, and during that time showers are of frequent occurrence. The average yearly rainfall on the Atlantic coast at Cristobal during 40 years of record, has been about 118 inches and at Porto Bello during four years' record, about 149 inches; at Culebra, during 20 years of record, about 83 inches, and at Ancon on the Pacific coast during a period of 13 years, about 66 inches. The maximum rainfall for 24 hours was 10.86 inches; for one hour 5.86 inches, and for three minutes, 2.46 inches.

DAMS ON THE PACIFIC SIDE

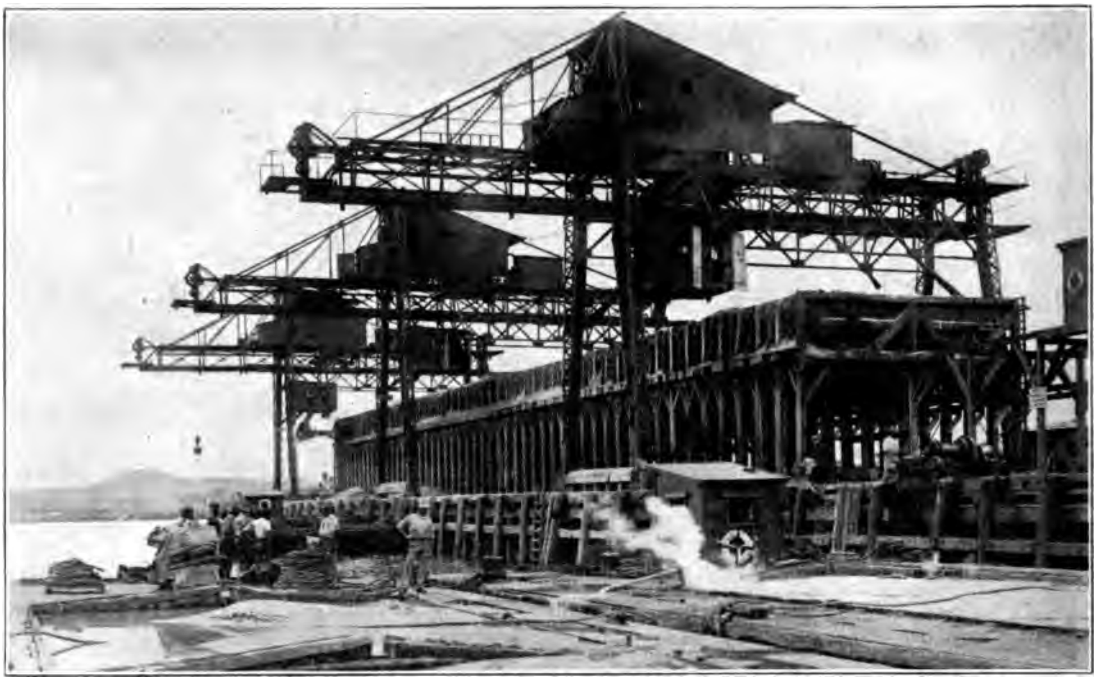
Pedro Miguel and Miraflores locks occupy the ancient valley of the Rio Grande. Here it was necessary to construct two small earth dams, one on the west side of Pedro Miguel lock, about 1,700 feet long and 105 feet high at its crest; and the other, west of Miraflores locks, about 2,700 feet long, and 70 feet high at its crest. The Miraflores barrier consists of earth and rock toes, with an impervious core fill, and dams the Cocoli River, forming Cocoli Lake, now a part of Panama's water supply system. To the east, both Pedro Miguel and Miraflores locks approach close to the hills, so it was only necessary to join locks and hills by concrete walls.



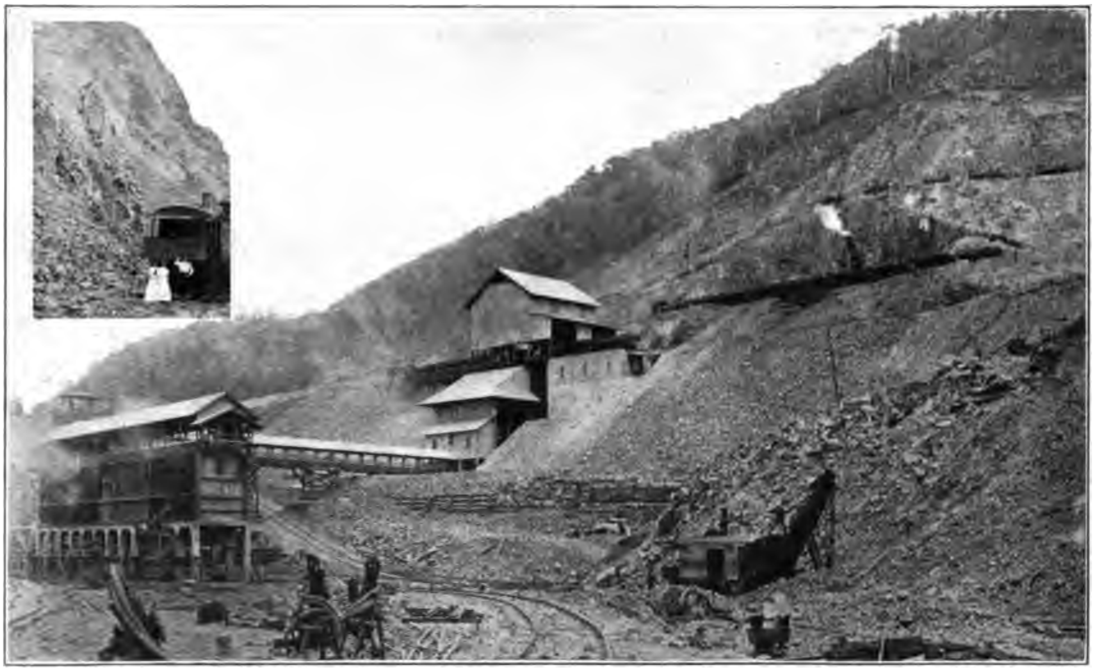
The concrete operations at Gatun locks required modern handling machinery. These are the unloading cableways at Gatun docks. Rock and sand are picked up from the barges by clamshell buckets and conveyed to storage piles.

THE LOCKS

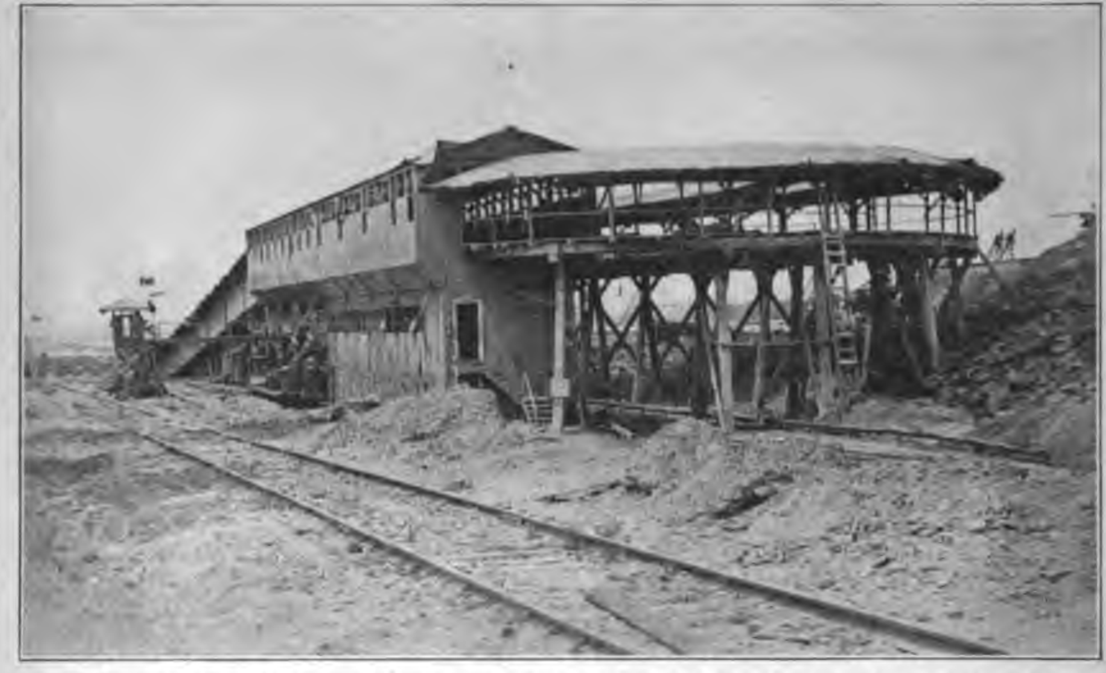
Under the original plans, the flight of two locks at Miraflores was to have been located at Sosa Hill near the Pacific entrance. The change was made upon the recommendation of the Isthmian Canal Commission, approved on December 20, 1907, by the President, because suitable lock and dam foundations could not be found. In addition, the site at Miraflores is six miles



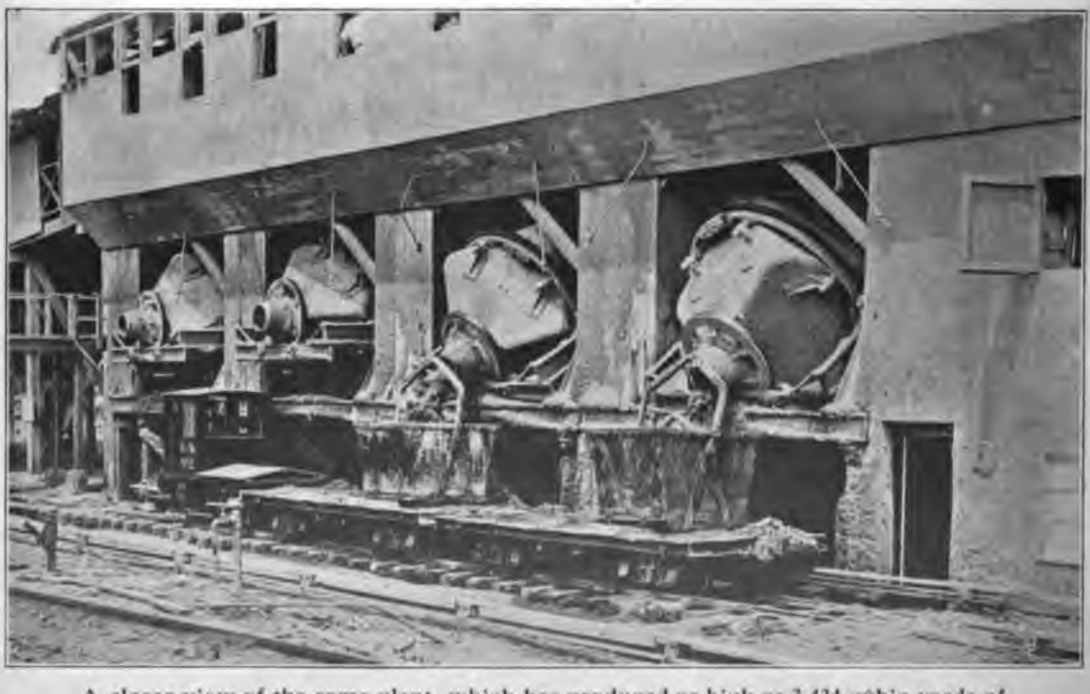
Sand bins and unloading cranes at Balboa. Sand for the concrete used in the Pedro Miguel and Miraflores locks was obtained from Punta Chame, about 25 miles along the Pacific coast from Balboa. It was towed to Balboa in barges, lifted into the bins by the unloading cranes and when needed was dumped from the bins into cars and hauled to the lock storage piles.



Ancon rock crusher plant and quarry, between Panama City and Balboa, where the crushed rock was obtained for the concrete used in the Pacific locks. The side of the hill has been literally eaten away to secure the large amount of rock required.



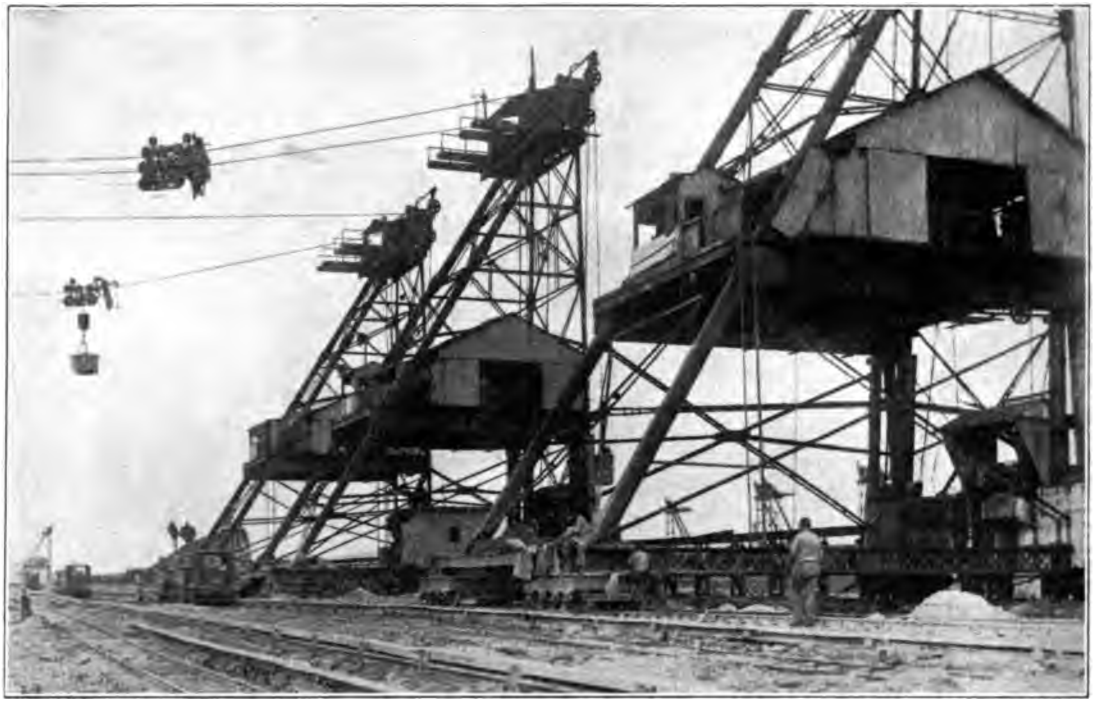
A general view of the main concrete mixing plant at Gatun Locks, which houses a battery of eight 2-cubic yard mixers. Rock and sand were carried to the mixers by an electric railroad running underground to a point beneath the storage piles. The finished product was carried to the lock site by a surface electric railroad.



A closer view of the same plant, which has produced as high as 3,434 cubic yards of concrete in a day of 12 hours, working 6-hour shifts.

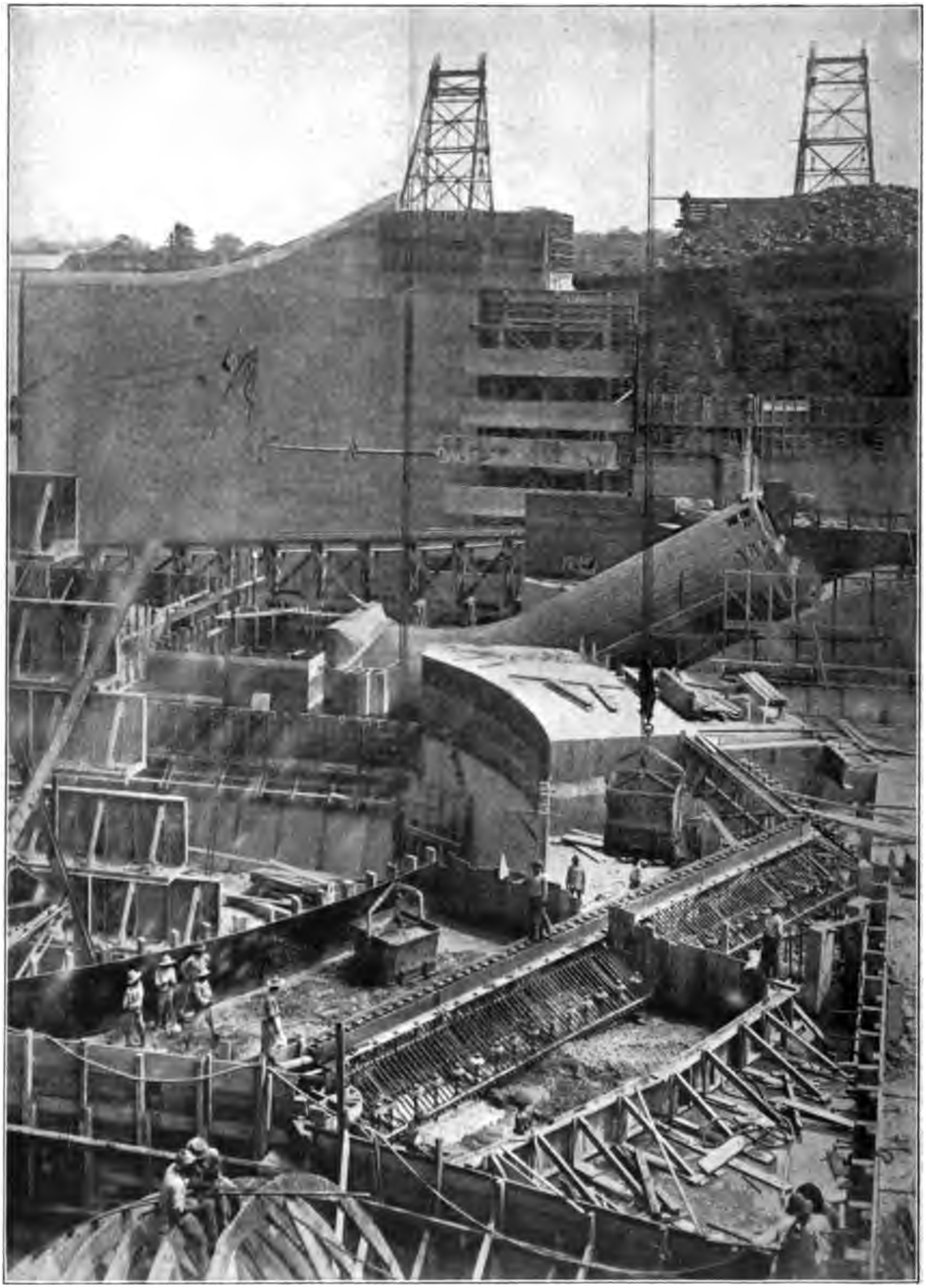
inland behind hills which will effectively protect them from the fire of a hostile fleet.

The locks under the original plans were to have a usable length of 900 feet, width of 95 feet, and a depth over the gate sills of 41⅓ feet. These dimensions were increased on January 15, 1908, in compliance with the wishes of the Navy Department, to a usable length of 1,000 feet and a width of 110 feet in order to allow the passage of larger battleships at that time contemplated. The height of the lock walls is about the same as that of a six-story building. The largest of the present-day ships, the *Imperator*, 919 feet long, can be locked through the canal. However, most of the ships that will use the Isthmian trade route, or that are likely to use it for many years to come, are less than 600 feet long. In fact, 95 per cent. of the vessels navigating the high seas are less than 600 feet long. For this reason, each lock is divided by intermediate gates into two chambers 400 and 600 feet long, respectively. This does not mean that the full length of 1,000 feet cannot be used if necessary, but with this division a saving in both water and time can be made in the locking of small ships.



Eight of these cableways, four on each bank, were used to place the concrete in the lock walls. They consisted of steel towers, 85 feet high, operating on their own tracks, and supported cables, which carried the concrete buckets back and forth.

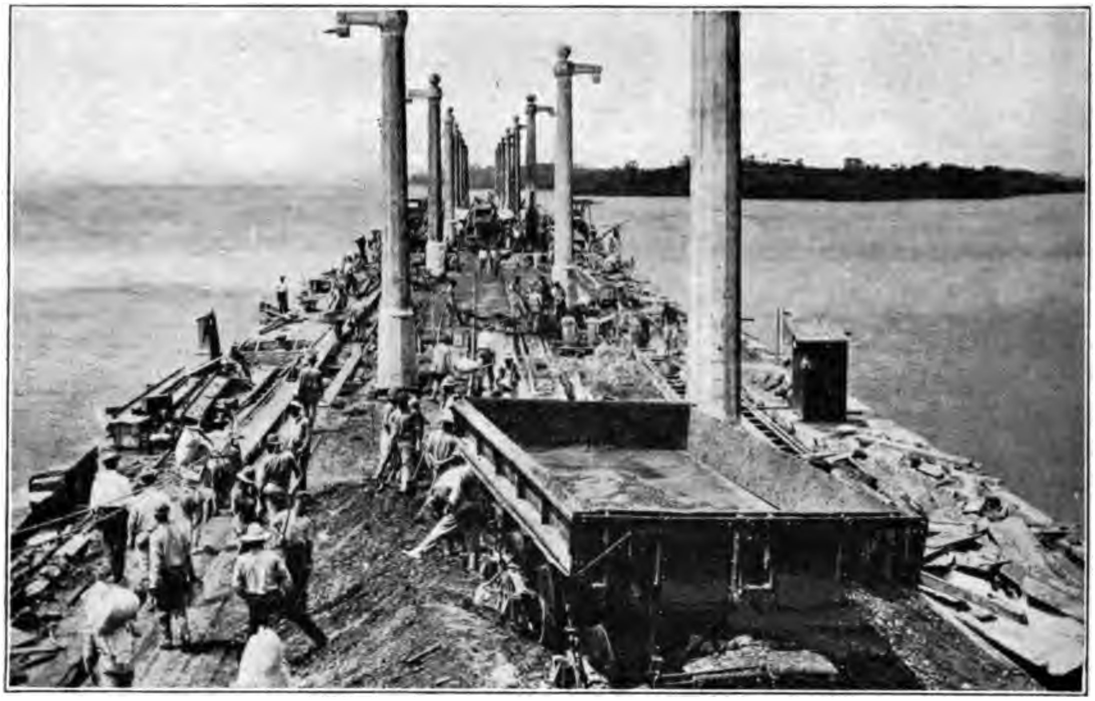
There are six double locks in the Canal, three flights of twin locks on each side of the Isthmus to lift ships from sea level to the lake level, and *vice versa.* They are made in pairs, in order that ships can be locked both up and down at the same time, and, in case of accident to one set, there will be no delay to traffic as the duplicate flight can be used. The usable dimensions of all are the same. Each lock is a concrete chamber with steel mitering gates at each end, and with the gates closed, ships are raised and lowered by simply admitting or withdrawing water. The side walls are 45 to 50 feet wide at the surface of the floor,



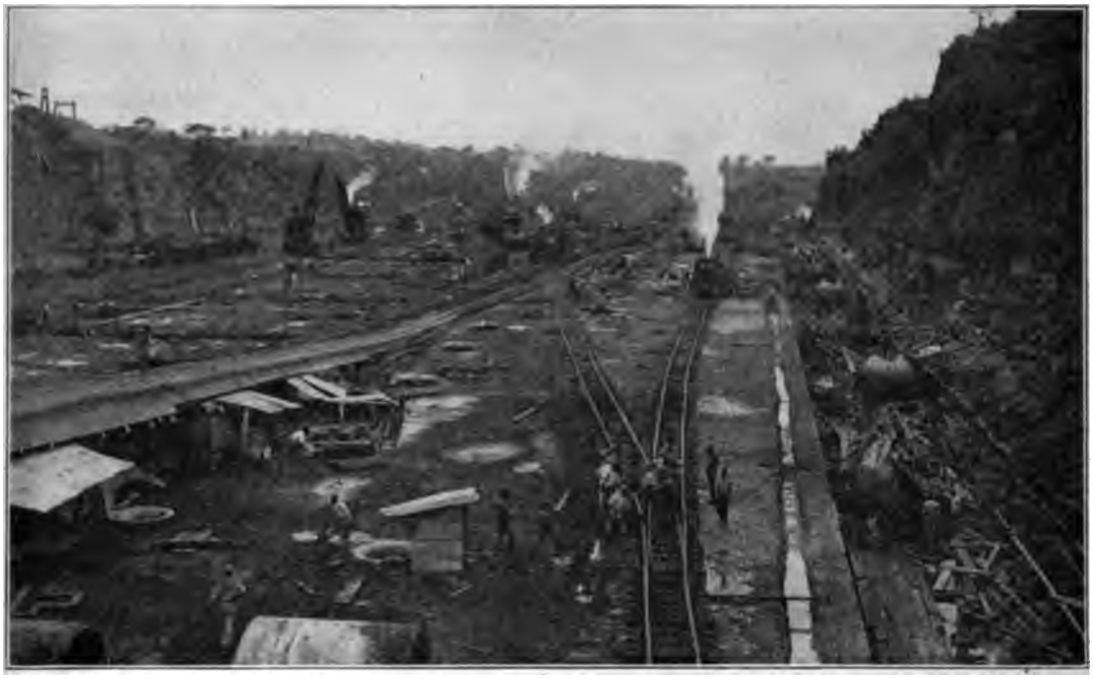
This view shows the dumping of concrete at Gatun Locks. Every move of the bucket is at the will of the man stationed in the cableway tower, who, in dumping, follows the signals of the man supervising the operation. As fast as the concrete is deposited, men, standing knee deep in the mixture, spread it out evenly.

perpendicular to the face, and narrow from a point 24⅓ feet above the floor until they are eight feet wide at the top. The center walls are 60 feet wide, approximately 81 feet high, and each face is vertical. In the six pairs of locks there have been placed approximately 4,500,000 cubic yards of concrete, requiring about the same number of barrels of cement.

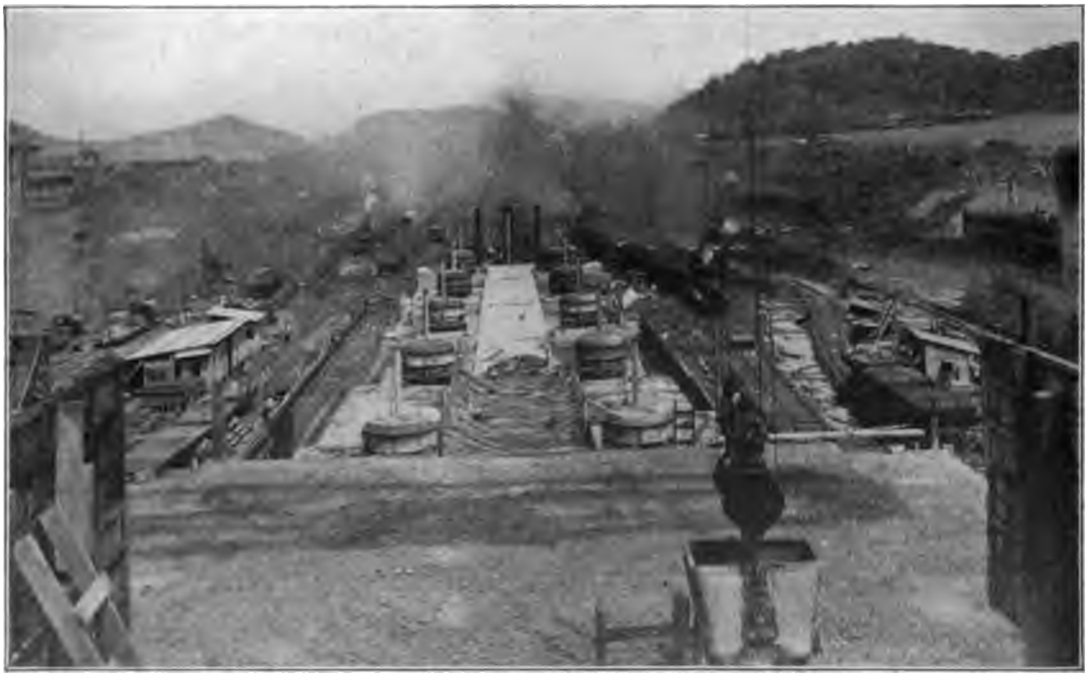
In the center wall of each set of locks, 42½ feet above the floor, there is a space 19 feet wide at the bottom and 44 feet wide at the top in which there is a tunnel divided into three galleries. The lowest gallery is for drainage; the middle, for the wires for the electric current to operate the lock machinery installed in the center wall, and the upper is a passageway for the operators. To fill and empty the locks there are culverts extending the entire length of the center and side walls. These culverts are 18 feet in diameter and are large enough to permit the passage of a railroad train. From these large culverts there are several smaller culverts, 33 to 44 square feet in area, which extend laterally under the floor of the locks and open into them through wells. These smaller culverts would permit of the passage of a two-horse cart. The water is conveyed from the lake level through the large culverts, and thence through the small lateral culverts to the lock chamber, thus insuring an even distribution of the water over the entire area of the chamber. This reduces the disturbance when the lock is being filled or emptied, so that ships are lifted or lowered without undergoing any strain or violent pitching. The flow of water through the culverts is controlled by valves. The large culvert in the center wall communicates with the chamber of each of the twin locks, so that water may be passed from one lock to the other of the pair, thereby effecting a saving. The average time required to fill and empty a lock is about 15 minutes, and the time



Sunday scene on south approach wall at Gatun Locks. In order to finish a piece of work within a given time, it was frequently necessary to work the men the full seven days.



The beginning of concrete work at Gatun Locks. Laying the floor and installing the lateral culverts. The circular holes in the floor are to admit the water to the locks, and to empty them. The floor varies in thickness from 13 to 20 feet of solid concrete, according to the character of material underlying it, and is anchored by steel rail to a depth of 10 feet.



Installing the cylindrical valves for the control of the flow of water in and out of the locks. The water control system of the locks consists of rising stem or Stony gate valves, and cylindrical valves. The rising stem valves govern the flow of water in the side wall culverts, and the cylindrical valves govern the flow of water in the center wall culverts.

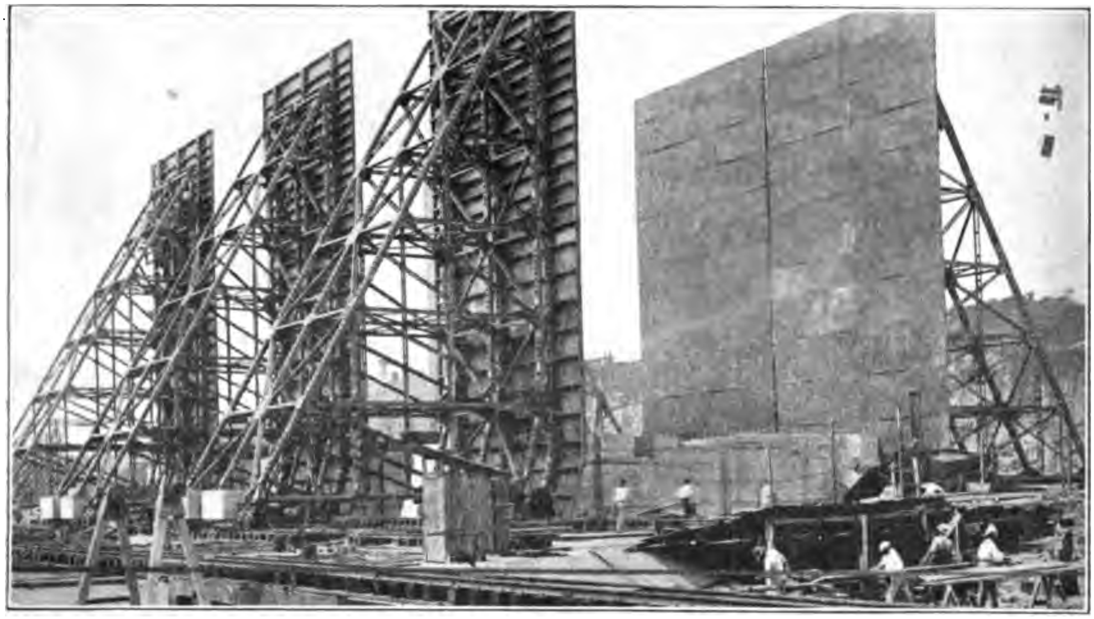
of passage of a vessel through the entire canal ranges from 10 to 12 hours, according to the size of the ship, and the rate of speed at which it can travel.

The lock gates are of the miter type, built of steel frame covered with steel plate, 65 feet long and from 47 to 82 feet high, according to their position in the locks. In all there are 41 gates of two leaves each. These gates weigh from 390 to 730 tons each, and, in order to reduce this weight as much as possible from the bearings and hinges upon which they swing, they are divided horizontally into two separate compartments. The lower compartment is water-tight, sufficiently buoyant to practically float in the water. The upper half, however, has an opening and, as the water rises in the chamber it flows into the upper half and adds sufficiently to the weight of the gate to offset the increased pressure of the water in the lock chamber.

The machinery for opening and closing the gates, operated by electricity, was invented by Mr. Edward Schildhauer, Electrical and Mechanical Engineer of the canal commission. It consists of a large "bull" wheel, mounted in a horizontal position on the lock wall, to the rim of which is fastened a steel strut or arm; this arm is also attached to the top of each gate leaf. The wheel rotates through an arc of 197 degrees, and closes or opens the gate leaf, according to the direction in which it is turned. This operation can be performed in two minutes, and it is similar to the action of a person who reaches out an arm to open or close a door.

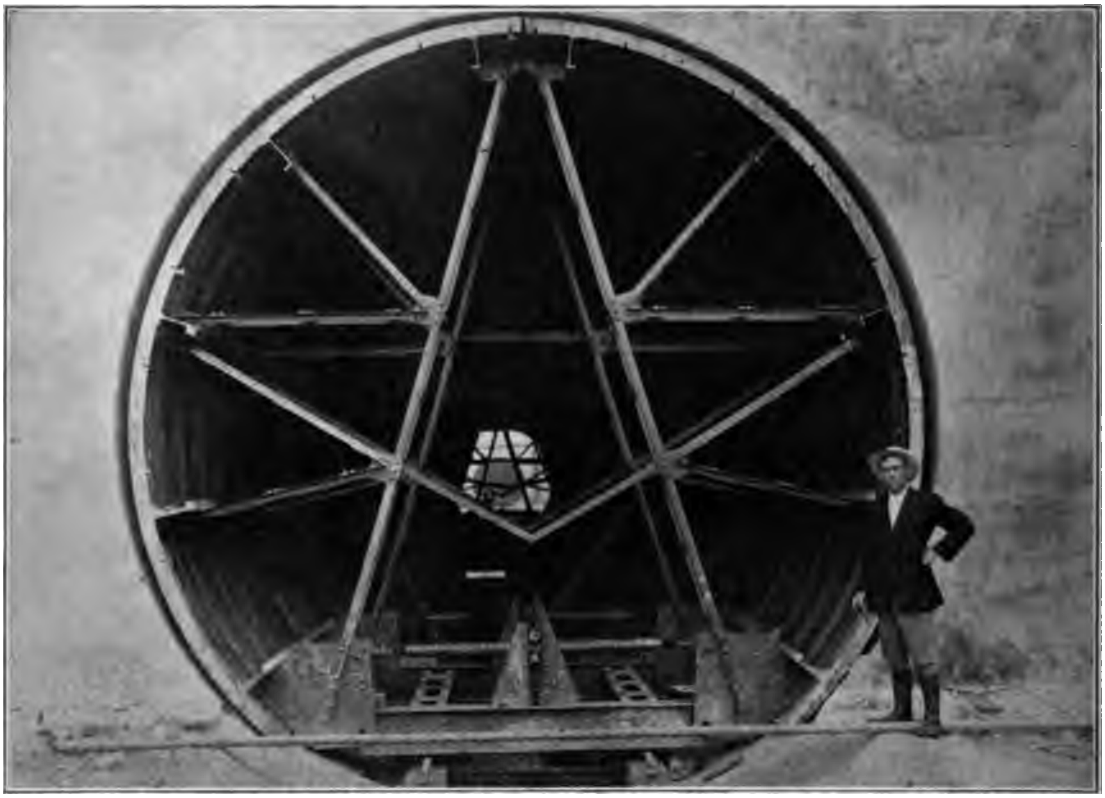
GUARDS AGAINST ACCIDENTS

To guard against accident, the gates at the entrances to all the locks and at the lower end of the upper lock in each flight are placed in pairs, thus eliminating the chances of a ship ramming the gate which is holding back the water of the level above. These guard gates miter outward to give them added power to resist any blow which might be given to them. They are also available for use in case the gates proper become damaged, or for any reason cannot be operated.



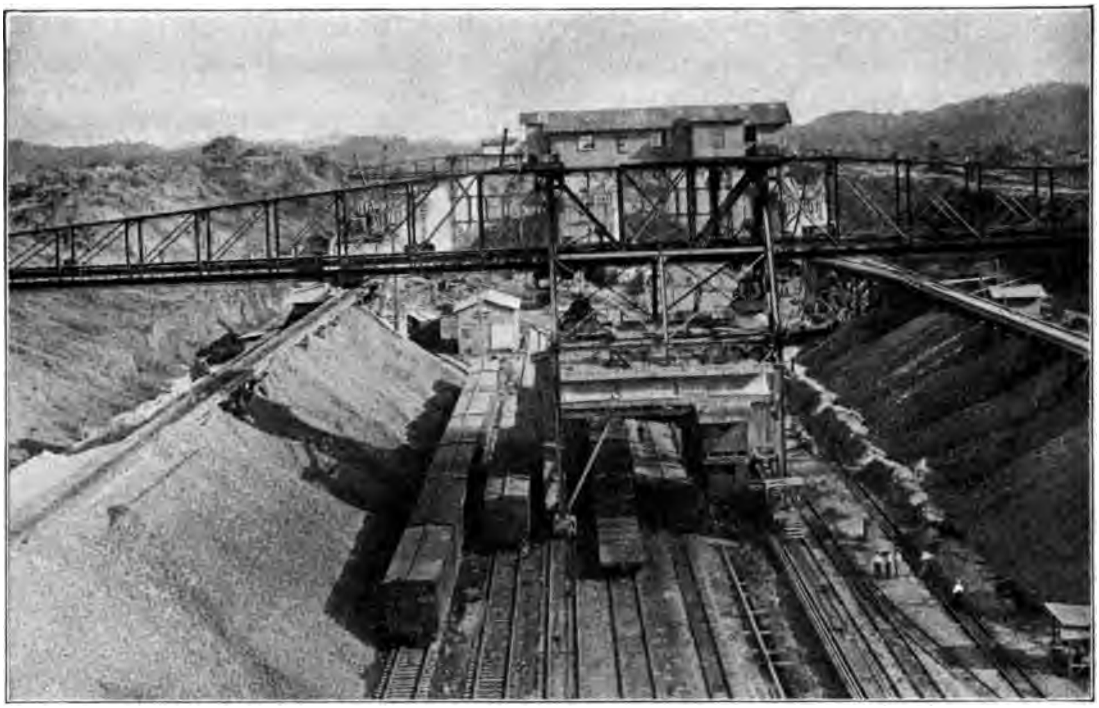
Steel forms in position for side and center wall construction. They are made of sheet steel, carried on movable towers and operated on tracks. Each tower and form weighs almost four and one-half million pounds.

Ships will not be allowed to enter the locks under their own steam, but will be towed through by electric locomotives operating on the lock walls. A ship about to enter the locks will first come to a standstill alongside the approach walls where the towing locomotives, two on each wall, two forward and two aft, can attach their lines. Before the ship can enter a lock chamber it encounters a fender chain which has been placed on the upstream side of all the gates of the upper locks, and in front of the guard gates at the lower end of each flight of locks, to prevent the gates from being rammed by a ship separated from the towing locomotives, or approaching the gates under its own steam. In operation the chain is stretched across the lock chamber from the top of the opposing walls; when it is desired to allow a ship to pass, the chain is lowered into a groove in the lock floor, and is raised again after the ship passes. It is worked by a hydraulically operated system of cylinders, and is capable of bringing to a stop a 10,000-ton ship, running at four knots an hour, within 73 feet, which is less than the distance between the chain and the gate.



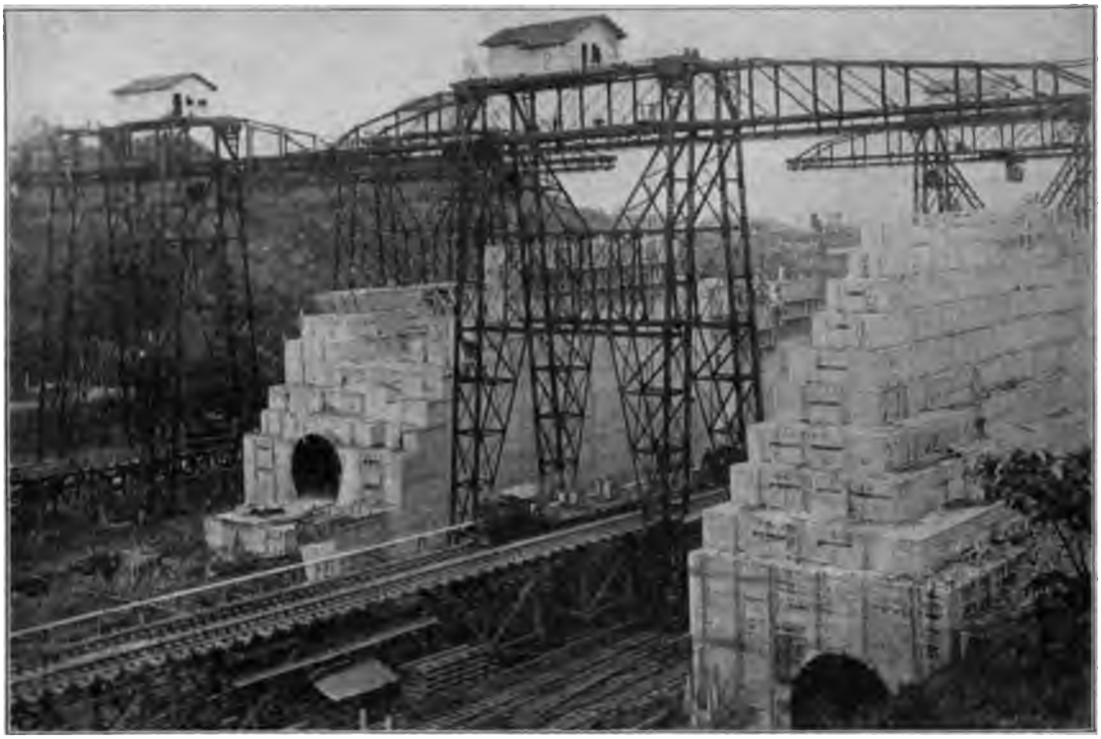
Method of constructing the 18-foot side wall culverts. Collapsible steel forms were used and after the concrete had set, were taken down in sections.

In case these precautions to prevent accident to the gates fail, or in case it should be necessary to make repairs which would necessitate the shutting off of all water from the lake levels, an emergency dam of the movable type has been placed above each flight of locks. This dam is a steel truss bridge of the cantilever type, pivoted on the side wall of the lock approach. When not in use it rests upon the side wall parallel to the channel. When required for use it is

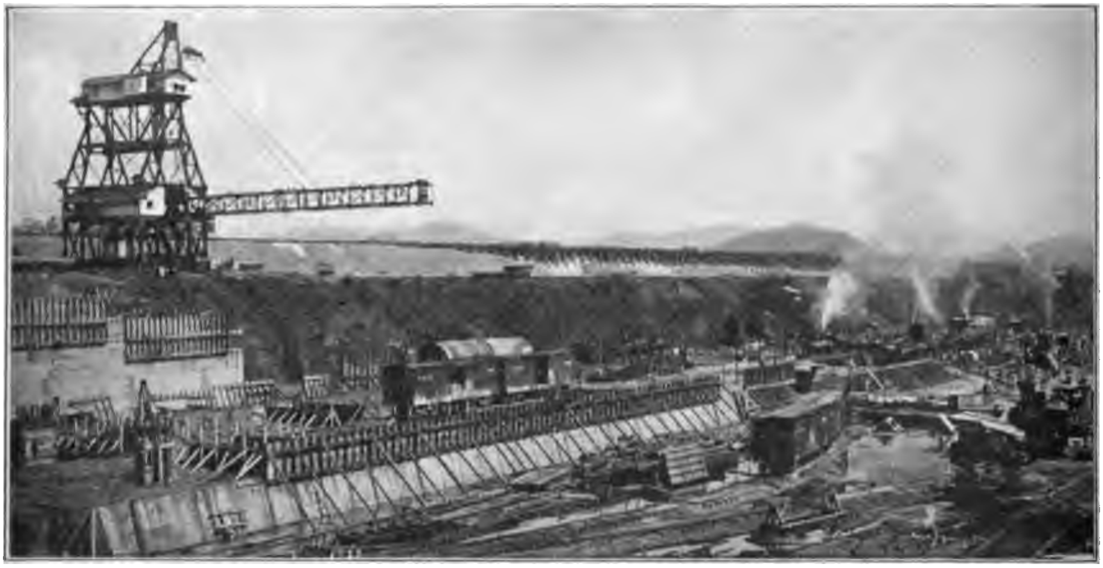


The handling equipment used at Pedro Miguel and Miraflores locks was entirely different from that at Gatun. At Pedro Miguel, Berm cranes, containing the mixing machinery, were stationed at the head of the lock, with arms extending on either side, from which grab buckets were lowered to pick up sand and rock, as the case might be.

The finished product was carried by these trains into the lock chambers. Many of the old French locomotives were repaired and used for this work.



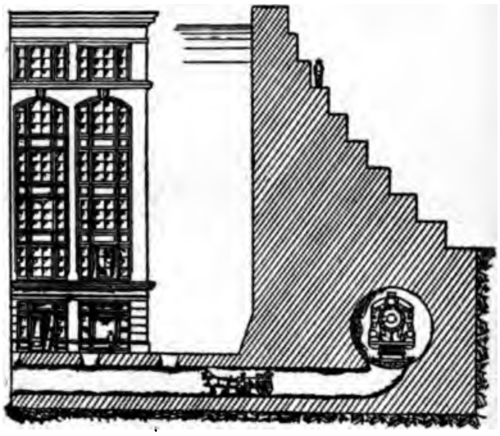
The Chamber cranes, shown here, lifted the buckets of cement from the train and transported them to the point desired. The method of dumping by the Chamber cranes is very similar to that of the Gatun cableways, the operation being controlled by a man stationed in the cage on the trolley arm. These cranes operated on tracks, were self-propelling, and were used to advantage also in handling heavy pieces of lock machinery.



Berm cranes at Miraflores Locks. With the completion of the heavy masonry work at Pedro Miguel, the cranes were moved to Miraflores Locks. The mixing cranes were slightly modified, and were stationed on the banks of the locks, instead of at the head, dumping directly into the side walls, while the chamber cranes were used solely for center wall construction. This method eliminated the necessity of concrete carrying trains to a large extent.

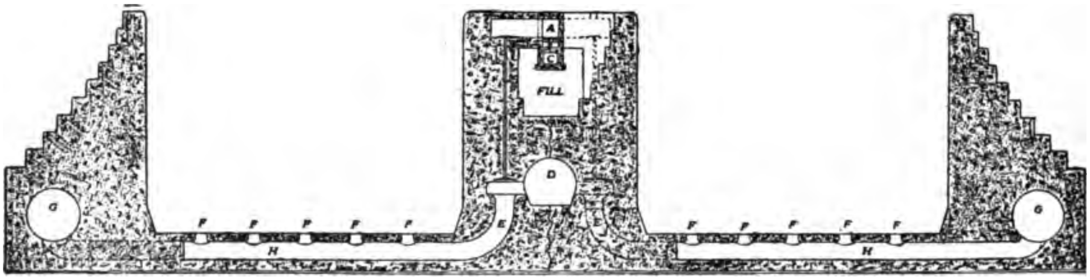
swung across the channel, with its end resting on the center wall of the lock. A series of wicket girders hinged to it are then lowered with their ends resting in pockets embedded in the lock floor. The action of these girders might be compared to the dropping of the tines on a sulky rake, with the exception that the girders are hung on individual pivots. After these girders have been lowered into place, they afford runways for gates which are let down one at a time, closing the space between them. The first row of plates lowered close the channel to a height of 10 feet; another series of panels lowered brings this height to 20 feet, and so on until the channel is completely closed. With the main flow of water checked, the remainder, due to the clearance between the plates, is checked by driving steel pipes between the sides of the adjacent panels.

When it is desired to gain access in the dry to the sills of these emergency dams, or to repair the lower guard gates of the locks, and the gates of the spillway dam, floating caisson gates of the molded ship type are available. When their use is required they are towed into position in the forebay of the upper lock, above the emergency dam, or between the piers of the spillway, and sunk. They are equipped with electric motor driven pumps for the purpose of pumping out the caissons and for unwatering the locks.



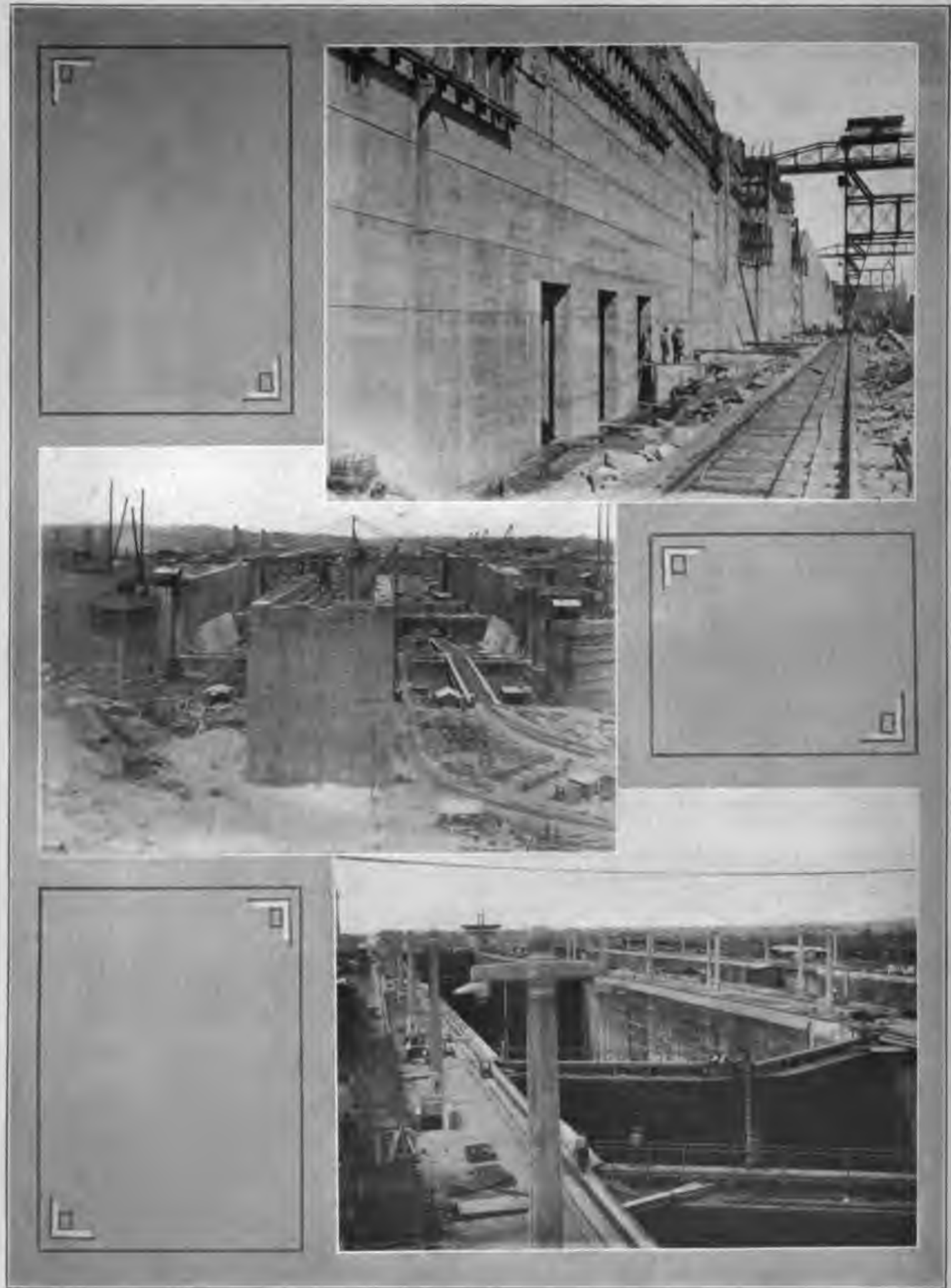
This gives an idea of the height of a side wall of the locks, as compared with a six-story building. The main operating culverts will permit of the passage of a standard size locomotive and train of cars, while a team and wagon could travel through the lateral culverts.

The gates, fender chains, emergency dams, towing locomotives, and culvert valves are operated by electricity, and all but the towing locomotives will be controlled by operators stationed in a control house on the center wall from which all parts of the locks can be seen. These houses are equipped with a double control board duplicated to conform to the duplication in locks. It contains a representation, part model and part diagrammatic of the flight of locks controlled by the respective series of switches. As the operator throws the switches he can see before him, in model or diagram, the progress of the fender chains, the movement of the gates, the opening and closing of the gate



CROSS SECTION OF LOCK CHAMBERS AND WALLS OF LOCKS

A—Passageway for operators.
B—Gallery for electric wires.
C—Drainage gallery.
D—Culvert in center walls.
E—These culverts run under the lock floor and alternate with those from side walls.
F—Walls opening from lateral culverts into lock chamber.
G—Culverts in sidewalls.
H—Lateral culverts.



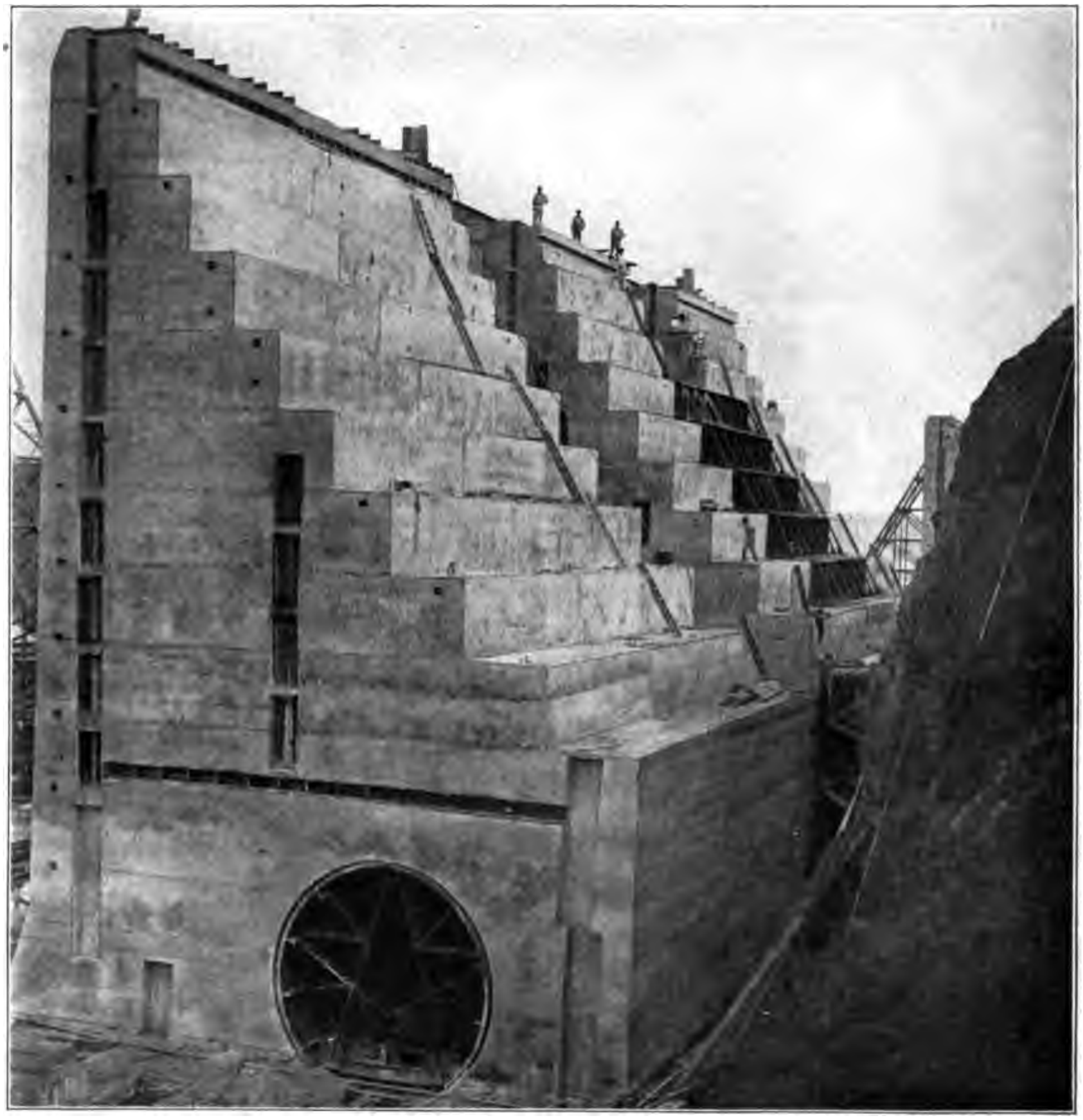
The upper picture shows the intakes in the walls where water is let in and out of the culverts. The center picture gives a view of Gatun locks under construction. In the lower picture the square concrete building in the distance is the control house from which all of the lock operating machinery will be manipulated.

valves, and the rise and fall of the water in the lock chambers. The system is interlocking so that certain motors can not be started in a certain direction until other motors are operated in a proper manner.

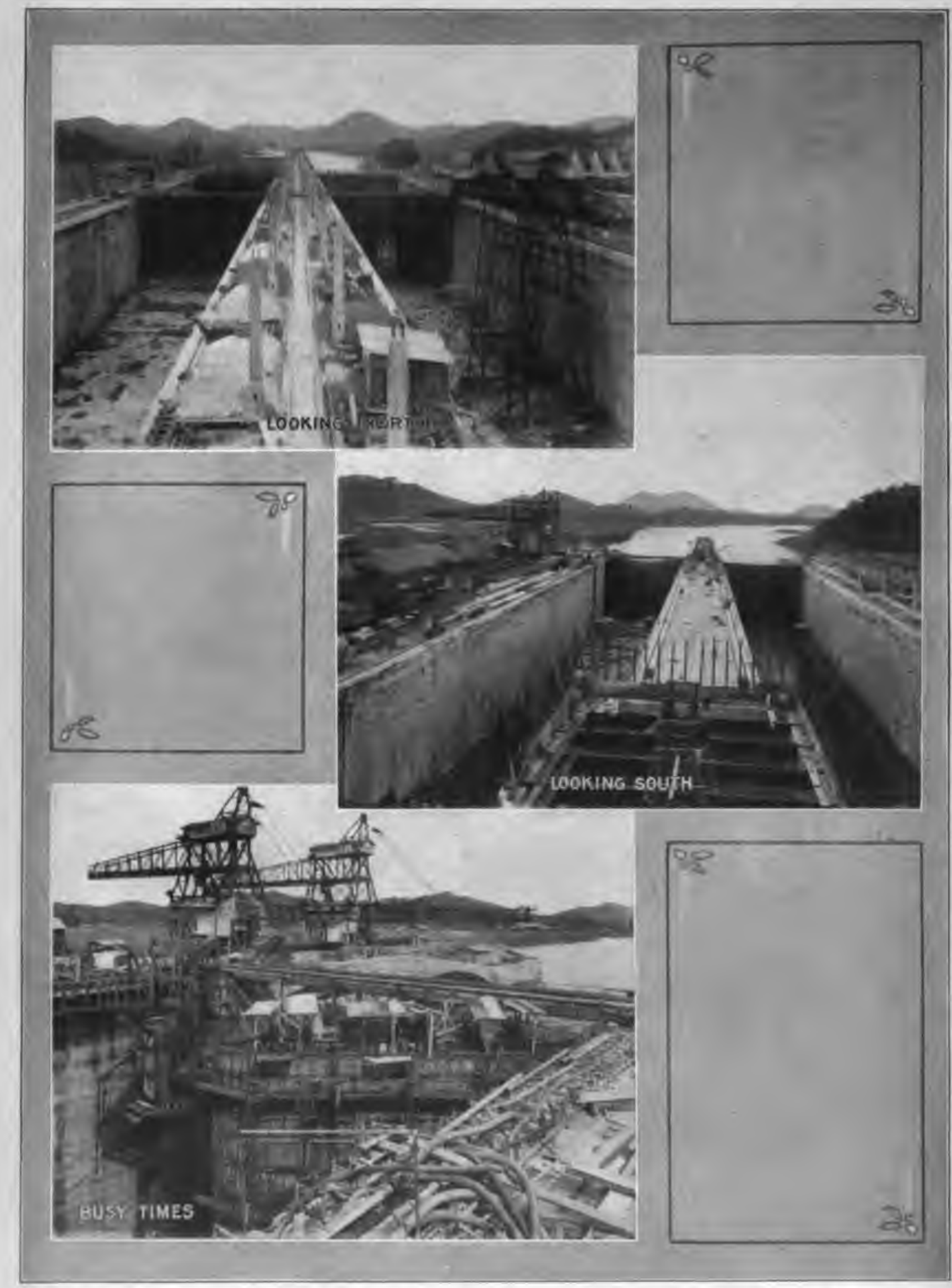
HOW THE LOCKS WERE BUILT

One of the most interesting sights to the canal visitor during the time construction work was in progress on the locks was the working of the concrete mixers and the cableways and cranes, now dismantled, which carried the material to the point where it was to be poured.

At Gatun locks, where 2,043,763 cubic yards of concrete were placed, the assembling and the distribution of the material was done by means of industrial

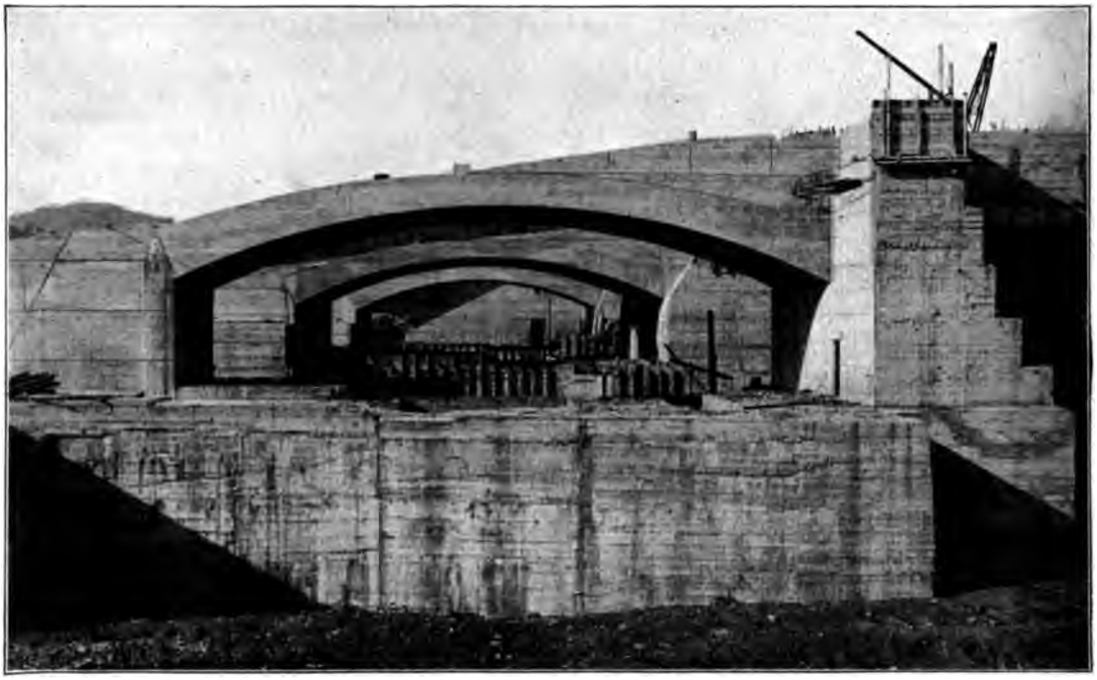


The first monolith completed at Gatun Locks early in 1910. These monoliths are huge blocks of concrete, which joined together, make a continuous wall almost a mile long. This is one of the outside walls, and the space has been filled in with earth and rock level with the top, where you now see the steps.



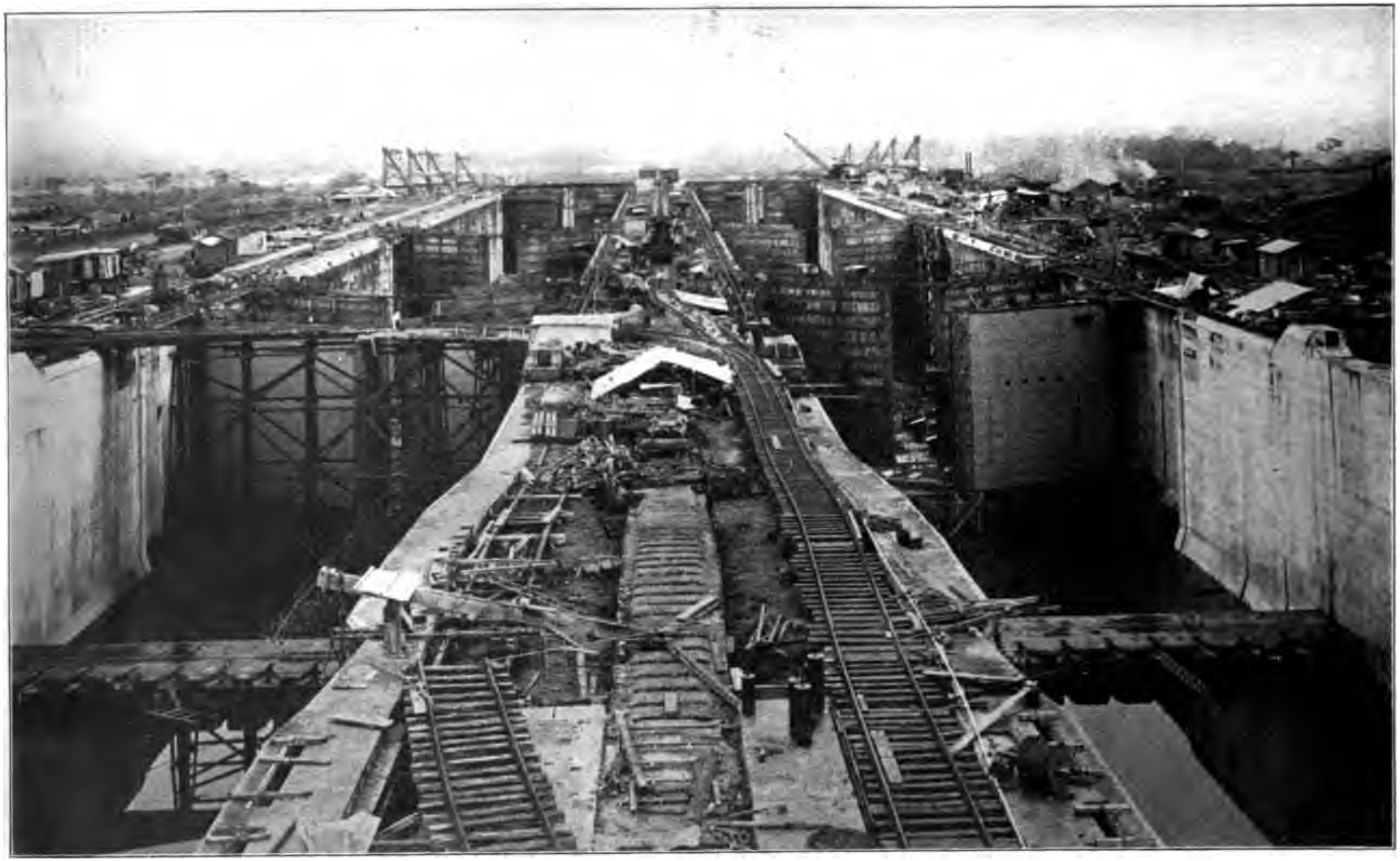
The upper picture shows a view looking north from Miraflores Locks. Pedro Miguel Lock in the distance, site of Miraflores Lake in between. Spillway to the right, temporary bridge for the gate contractors to the left of picture. The center picture shows a view looking south from the same lock, Ancon Hill in the distance. The lower picture presents a busy scene at the locks when the gates were under construction.

electric railways and overhead cableways. From the docks in Cristobal, the cement was carried in barges up the old French canal, which had been deepened for the purpose, to a cement storage dock at Gatun. Rock quarried and crushed at Porto Bello, about 17 miles east of Colon, and sand dredged at Nombre de Dios, about 35 miles east of Colon, was towed in barges to Gatun docks. This material was unloaded by overhead cableways, upon which grab buckets were hung, and carried to storage piles. The material was then assembled in the mixers by cars operated under the cement shed and under the sand and rock storage piles. Another electric railway carried the buckets of concrete to the bank above the lock sites. At this point the full buckets were lifted from the cars by cableways stretched across the lock site and lowered into the lock chamber where desired. There were eight of the cableways arranged in pairs, each pair stretching from a steel tower 85 feet high to a similar tower on the opposite side of the locks, a distance of 800 feet. These towers were placed on trucks on which they could be moved along tracks parallel to the locks to the point desired. Besides the concrete, the cableways also handled heavy construction material, such as steel forms and lumber. Their capacity was six tons each, and the greatest lift 170 feet for a distance of 670 feet.

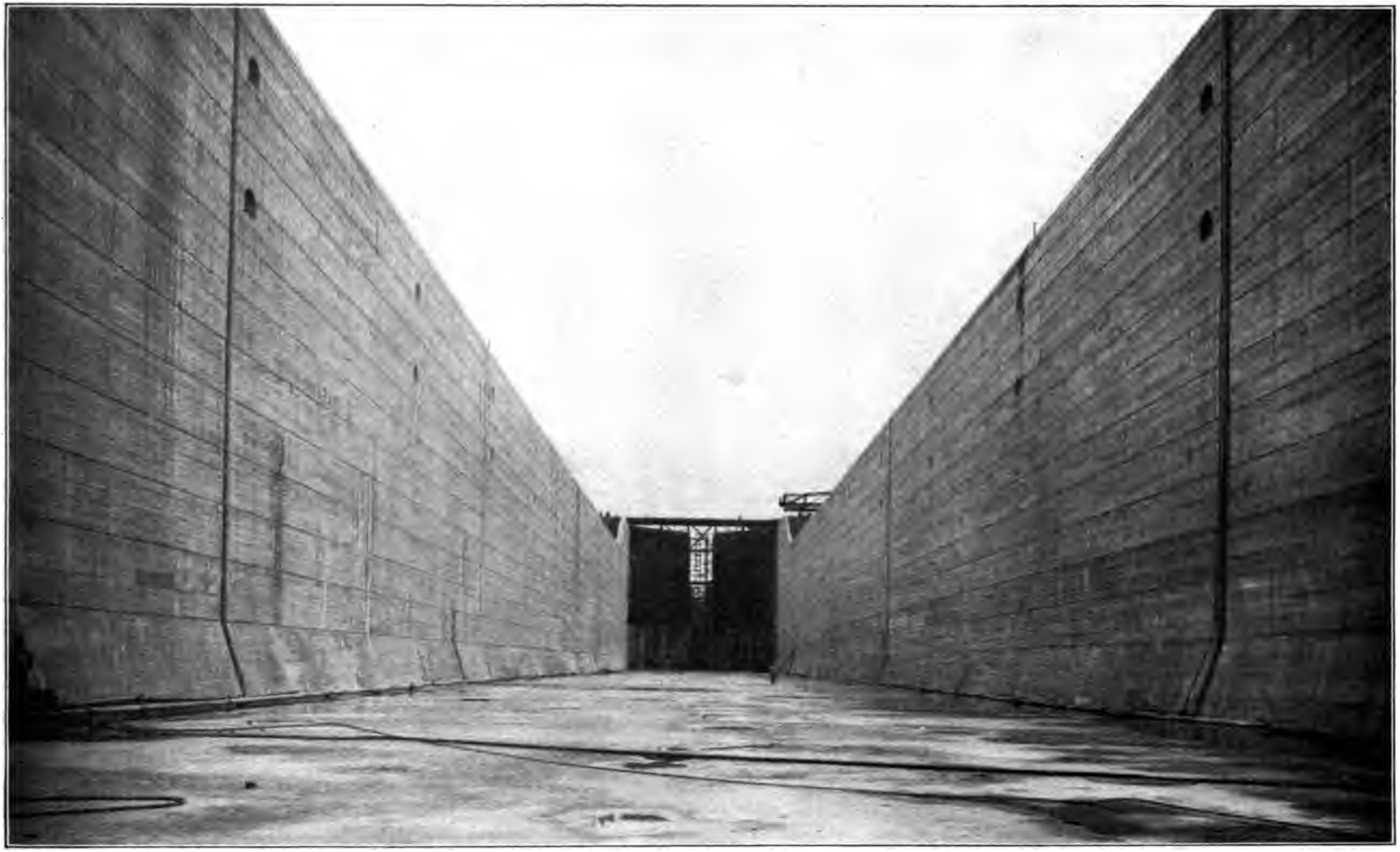


The lock walls as a whole give the visitor an idea of massive construction only. The arched sections, shown in the picture, connecting the main walls with the wing and guide walls, effect a saving in concrete and also give a symmetrical touch to the structures.

For the locks at the Pacific end a distinctly different system was employed. Placement at Pedro Miguel was made by means of four cantilever cranes, two resting on tracks on the floor of each lock chamber, and two berm cranes equipped with two 2-cubic yard mixers in the upper forebay. Each of the chamber cranes was 95 feet high with cantilever arms, which extended to both sides from the center. Placement in the approach and wing walls was made by means of



A general view of Gatun Locks as they appeared October 1, 1912. All heavy masonry work, with the exception of the north approach wall was completed, and this view gives an idea of their magnitude. Each lock contains two parallel chambers separated by a center wall. The side walls are 45 to 50 feet wide at the floor level, and narrow to a width of 8 feet at the top. The middle wall is 60 feet wide and 81 feet high.



View inside the lower lock, west chamber, Miraflores Locks. The lock chambers are the largest concrete troughs in the world, having usable dimensions of 1,000 feet in length and 110 feet in width, and at the present time will accommodate the largest ships afloat. A striking comparison is obtained by looking at the man standing on the lock floor.

derricks, which lifted the buckets from concrete trains which ran between the mixer and chamber cranes.

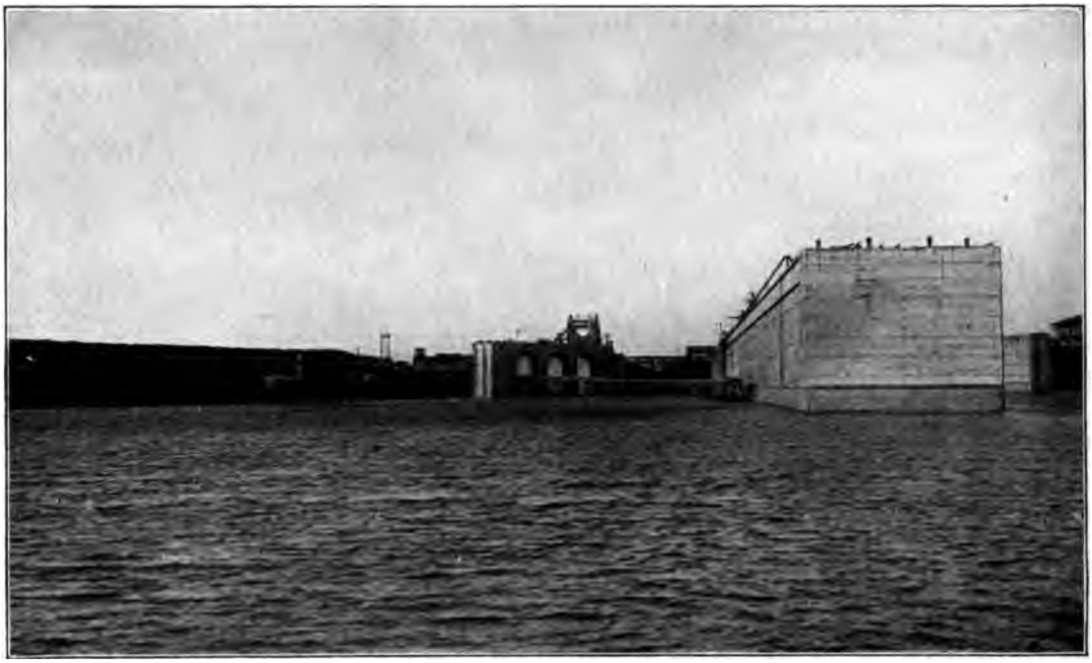
When the heavy masonry work at Pedro Miguel was finished the chamber cranes were transferred to Miraflores, and operated in the same manner. The berm cranes were modified in order that they might be operated on the sides of the locks, instead of at the head.

The crushed stone for the concrete of both Pedro Miguel and Miraflores locks was supplied by rail from a large quarry and crusher plant on the west side of Ancon hill near Panama. Sand was dredged at Punta Chame, on Panama Bay, 23 miles west of Panama. It was hauled in barges to Balboa and there unloaded by special machinery and hauled by rail to the storage piles at the locks.

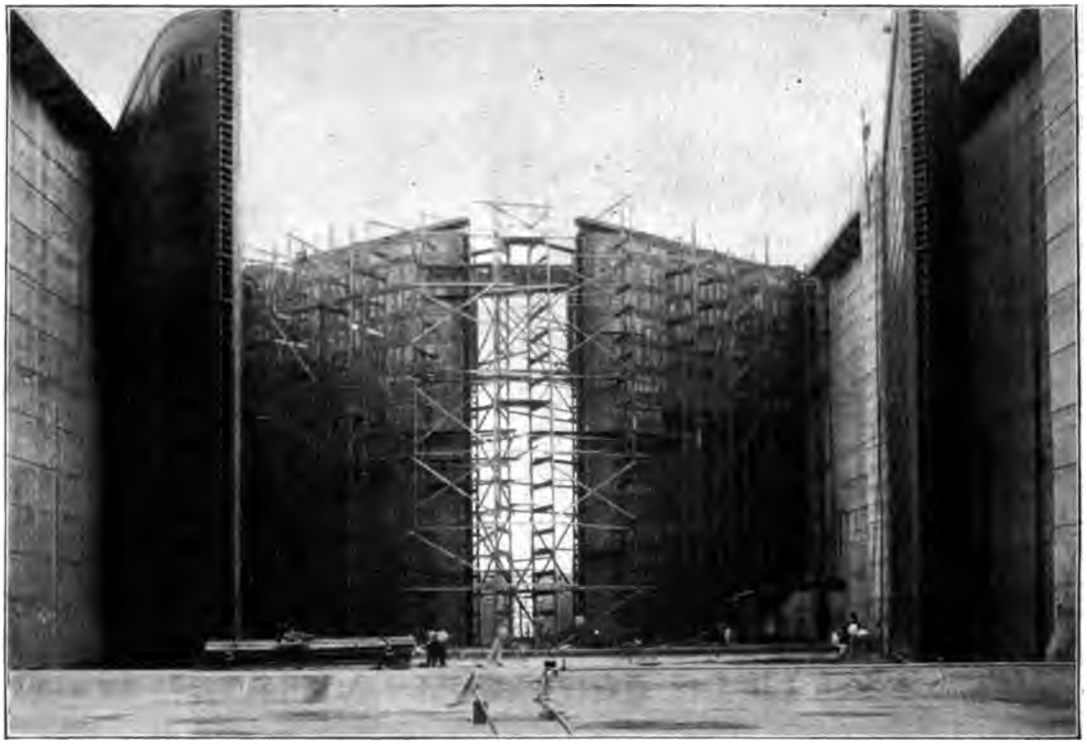
MAKING THE DIRT FLY

The work of excavation in the canal prism was divided into two classes, "wet" and "dry," that taken out by means of dredges, and that by steam shovels, respectively. The wet excavation, up to October 5, 1913, when water was admitted into Culebra Cut, was practically confined to the sea level approaches to the Canal, that at the Atlantic entrance seven miles to the locks at Gatun, and that at the Pacific entrance 8½ miles to the locks at Miraflores. The largest part of the excavation, however, was accomplished by steam shovels in Culebra Cut prior to the letting in of the water of Gatun Lake and in the Chagres section. There remained on September 1, about 9,153,000 cubic yards of spoil in Culebra Cut, out of a total of 95,869,000 cubic yards. The total excavation, "wet" and "dry" for the entire canal, as originally estimated by the minority members of the Board of Consulting Engineers, was 103,795,000 cubic yards, in addition to the amount excavated by the French companies,

Section of the north guide wall at Gatun Locks under construction. This was one of the most difficult pieces of masonry work in the whole job. The greater part of its length of 1,000 feet rests upon piles driven to solid rock. To the right is seen the east wing wall of the locks.



Entrance to Gatun Locks from the lake. Gatun Dam on the left and approach wall in the foreground. Approach walls 1,000 feet long, have been built at each end of all the locks, and as the name indicates, they serve as a guide to ships coming up the approach channel. Ships must come to a stop at these walls, until the locomotives which tow them through the locks make fast their lines.

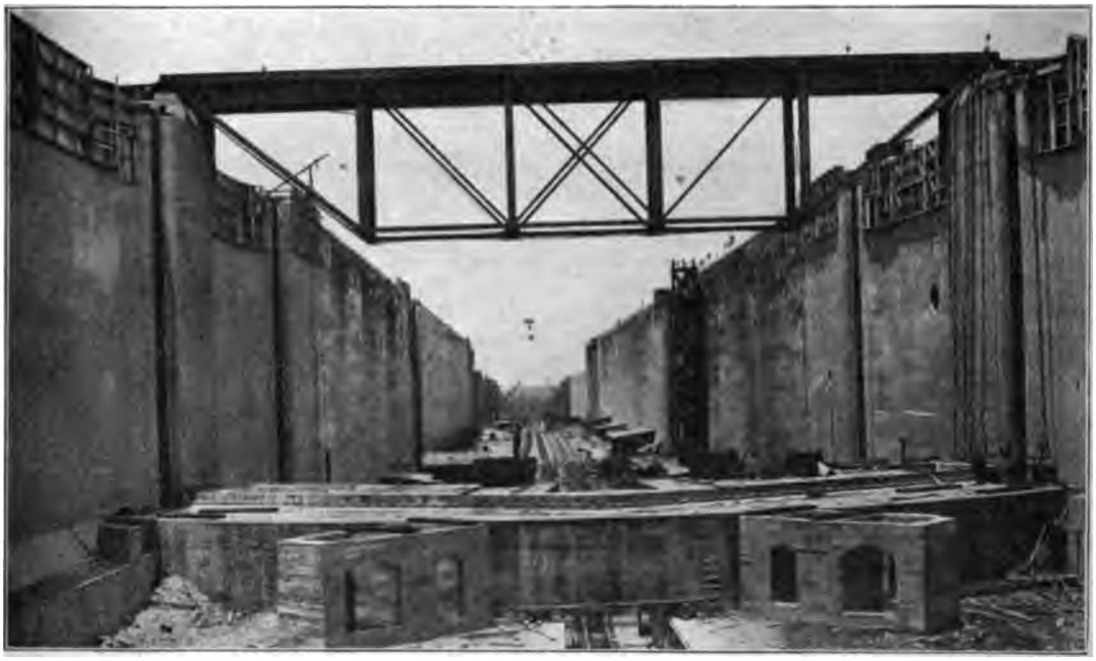


View of the upper gates at Miraflores Locks under construction. The first of these is completed and partly swung open to full view giving an idea of their thickness. The gates are operated by electricity and may be opened or closed in one minute and 47 seconds.

who accomplished 29,708,000 cubic yards useful under the present plans. This estimate has been increased several times on account of changes in the canal plans, to silting in the canal entrances and in the Chagres section, to slides in Culebra Cut, for the terminals at both entrances, and for the dry docks at Balboa. The last estimate made on July 1, 1913, places the grand total at 232,353,000 cubic yards, considerably more than double the amount originally estimated. When the canal is entirely completed, the excavated material would make a line of 63 pyramids, each equal in size to the Great Pyramid of Egypt.

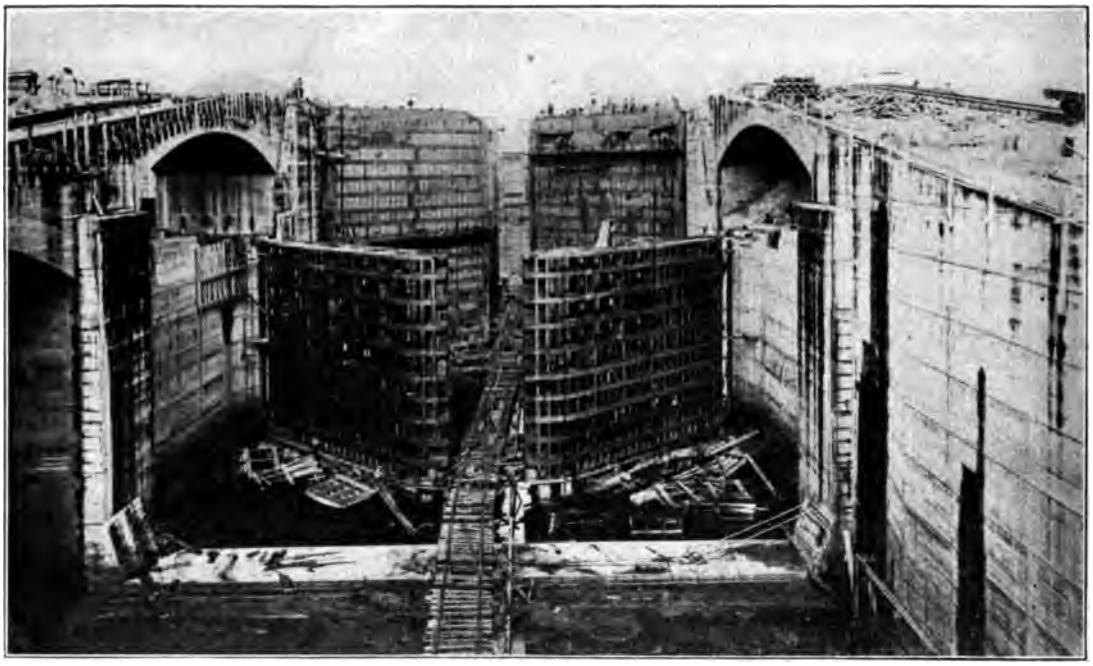
DREDGING

Most of the work in the Atlantic entrance, about 53,167,000 cubic yards, was accomplished by two elevator dredges left by the French, and overhauled by the Americans, a dipper dredge of American make, and a sea-going 20-inch suction dredge, also made in the United States. Where the channel ran inside the shore line two small hills were dug out by steam shovels to a depth of 41 feet, and the remainder then accomplished by the dredges.

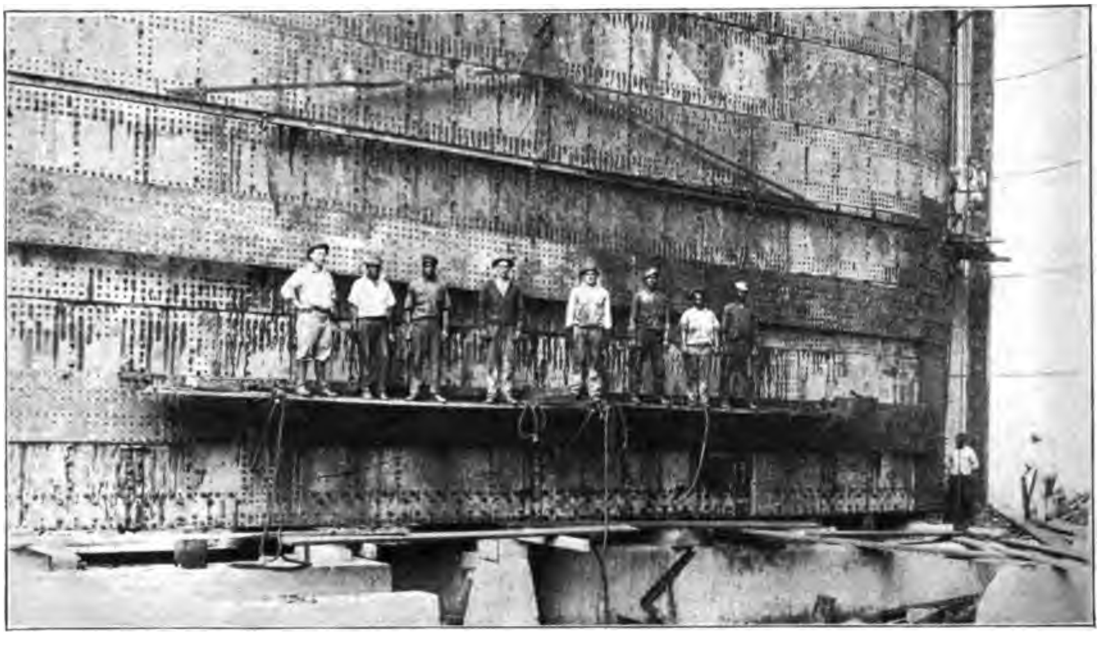


Completed sills from the lock gates. These sills, built of steel and concrete, form foundations on which the gates rest.

In the Pacific entrance about 61,489,000 cubic yards was accomplished by two elevator dredges of the Belgian type and two Scotch elevator dredges left by the French and overhauled by the Americans, a modern elevator dredge built in Scotland in 1911, and a sea-going 20-inch suction dredge. This latter dredge was floated into Culebra Cut in October, 1913, and is now at work taking out the remaining spoil in that section. In the Pacific entrance a large quantity of rock was encountered which was too hard for the dredges to handle.



The gates under construction at Pedro Miguel. The lock gates, 46 in number, two leaves to each gate, constitute one of the spectacular features of Canal construction. They are 7 feet thick, from 47 to 82 feet high, and each leaf or half gate weighs from 300 to 700 tons. They are built up of great horizontal girders weighing from 12 to 18 tons each, with vertical frame work in between, sheathed with steel plates on each side.



Near view of the massive lock gates showing riveting gang on scaffold. The lower part of each gate is an air chamber, so that in using it, the gate is buoyed up by the surrounding water, reducing the weight on its hinges, and making it easier to move. To overcome the lifting effect when the lock chamber is full of water, the upper half has openings on the up-stream side which allows it to automatically fill or empty, thus equalizing the weight.

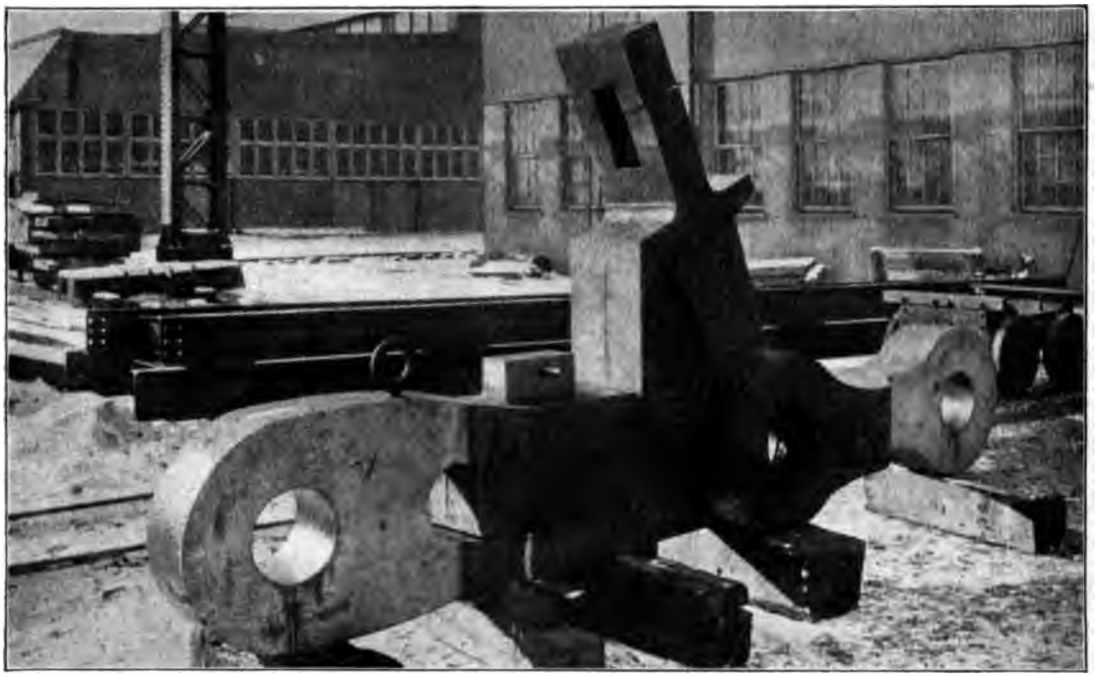
To break up this material, in addition to subaqueous blasting, a Lobnitz subaqueous rock breaker was used.

CUTTING THROUGH THE DIVIDE

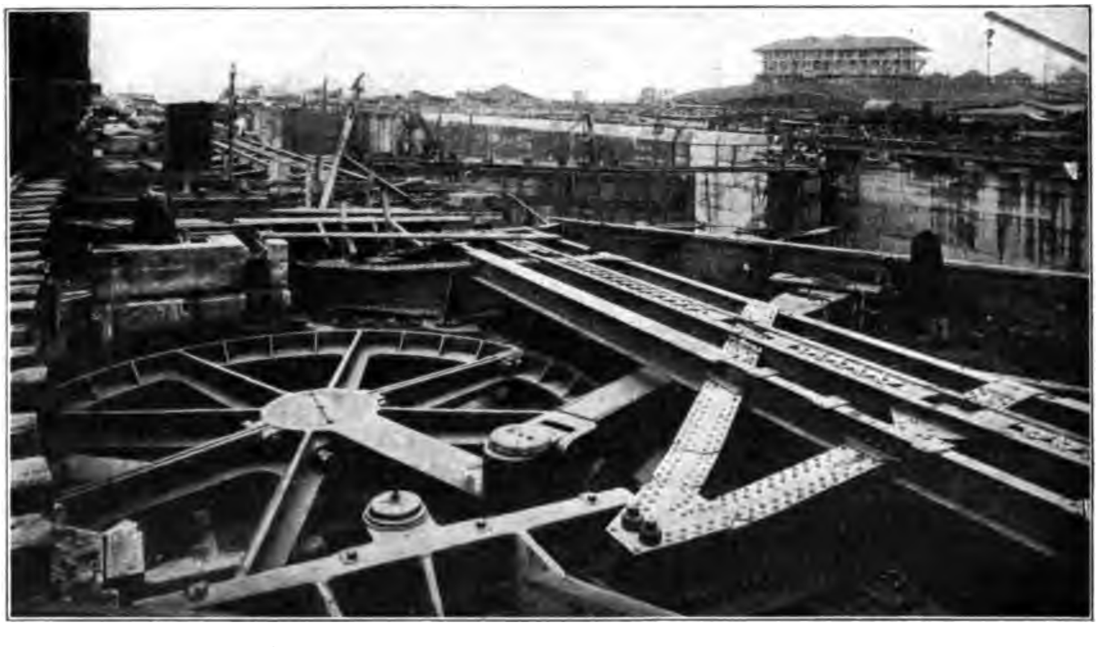
The part of the canal on which the most work has been done, and which was the last to be completed, is Culebra Cut, the 9-mile section through the continental divide. Work has been nearly continuous in this section since the French started operations in 1882. It is also one of the most important and interesting portions of the Canal project on account of the deep cutting necessary, and the difficulties encountered on account of slides and the disposal of spoil. When the Americans took over the work in May, 1904, they found the French engaged in taking out just sufficient material to hold their concession. This they were doing with a few obsolete side excavators, served by small Decauville dump cars and Belgian engines.

Close view of completed gates at Gatun Locks. There are 46 gates in the locks which aggregate 58,000 tons in weight, and if placed end on end would make a tower about one and one-fifth miles high. The author was standing on the lock floor between the partly closed gates when this photograph was taken.

Work was continued with the equipment left by the French until it could be gradually replaced with modern steam shovels, cars and engines. The first steam shovel was placed in operation on November 11, 1904, and the last of the French excavators was discontinued on June 16, 1905. On August 1, 1905, there were 11 steam shovels at work, but they were greatly handicapped in their output as they were served by old French cars operated on lines which, as Chief Engineer Stevens said: "By the utmost stretch of the imagination could not be called railroad tracks." Work was practically stopped until proper preparations could be made for handling the spoil and effecting an organization which would obtain the greatest possible results from the use of modern methods of

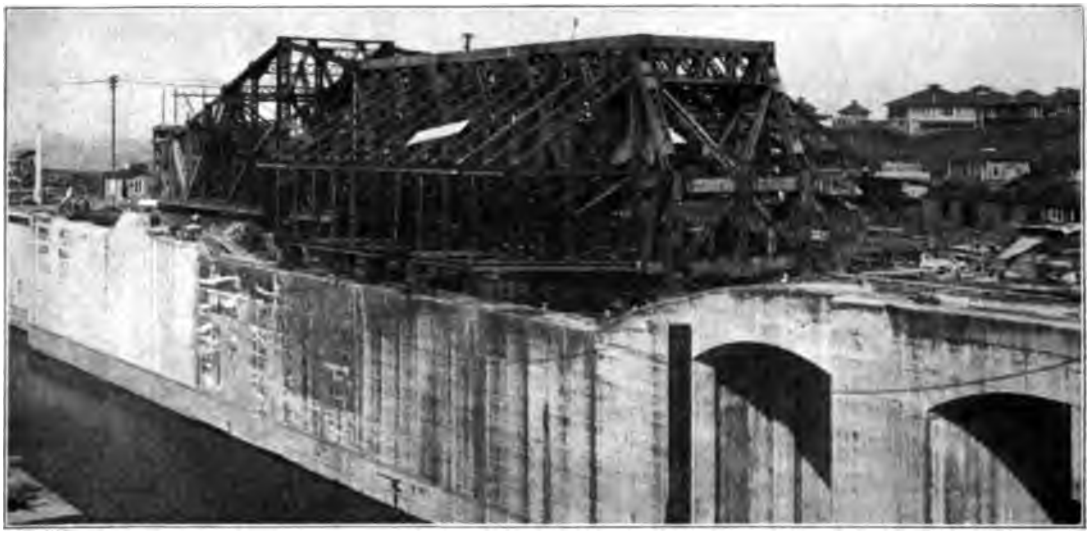


This illustrates the size to which even the smaller features of gate construction attain, as well as the care taken in their manufacture. This steel yoke, made of vanadium, is used to connect the tops of the gates with the anchors in the walls. It weighs 14,000 pounds, and was subjected to a stress of 3,300,000 pounds before it broke.



The operating mechanism of a lock gate. The wheel is a bull wheel, which, in operating, turns through an arc, giving the connecting rod the movement of an arm in opening and shutting a door. It is 19 feet in diameter, and weighs over 35,000 pounds.

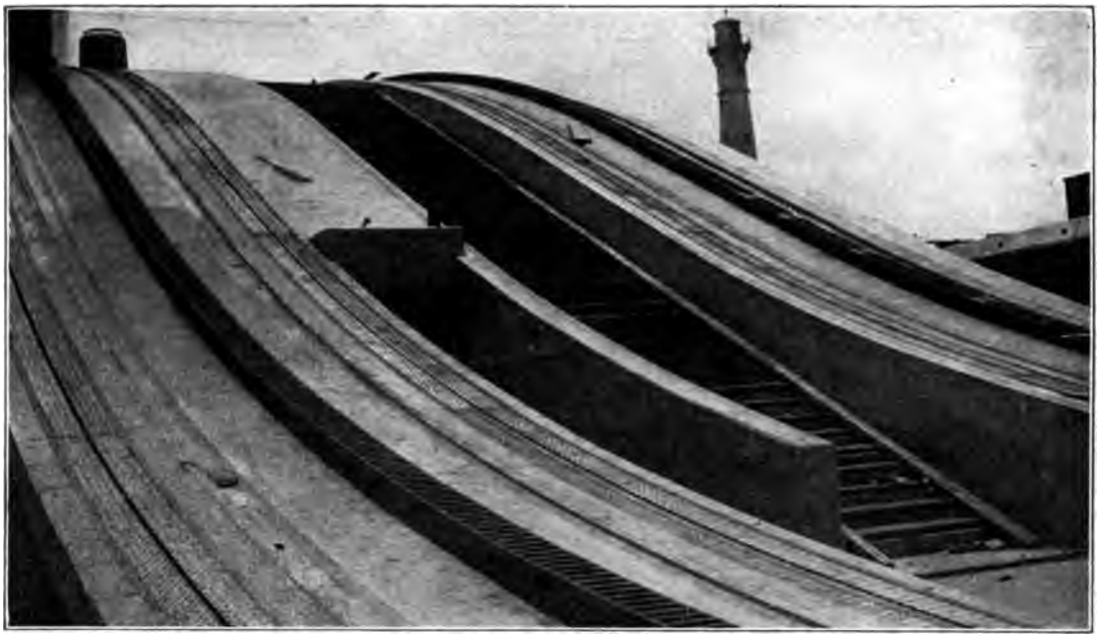
excavation. Tracks were properly laid, a proper transportation system inaugurated, and proper dumping places located before the work was resumed on a large scale in 1907. In that year 9,177,130 cubic yards were taken out, and from that time to when the maximum of 16,596,891 cubic yards was reached in 1911, there was a steady increase in the amount of material excavated as new equipment was installed. Trains of flat and dump cars, 20 to a train, drawn by 100-ton locomotives carried the spoil to be used in the dam at Gatun, the breakwater at the Pacific entrance, fills, or to dumps where it was merely wasted. As the Cut neared completion, the work became concentrated in a short section at Culebra where the deepest cutting, 272 feet, was necessary, and the number of steam shovels had to be gradually reduced.



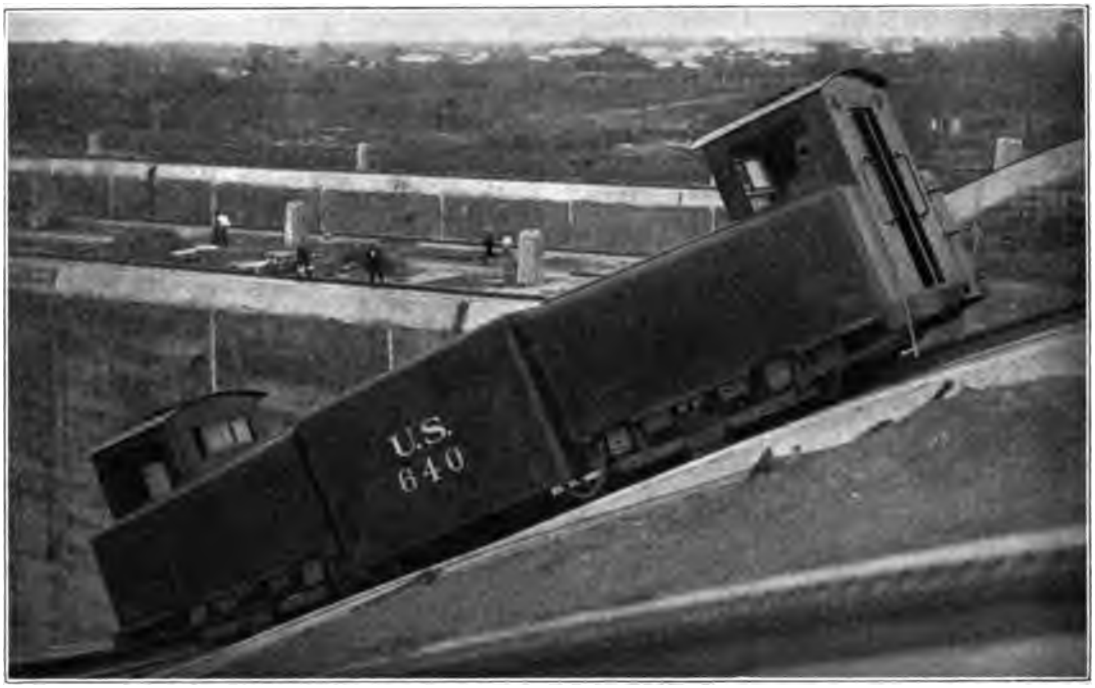
Side view of emergency dam on east wall at Gatun Locks. In case an accident occurred to the gates, allowing a free passage of water from the 85-foot lake level, to the sea level, the dam would be swung across the lock chamber and a series of wicket girders hinged to it would be lowered with their ends resting in pockets in the lock floor. Steel gates would then be let down, one at a time, which would close the lock chamber and check the flow of water.

To prevent the flooding of the Cut, the canal channel was paralleled on each side from Gold Hill north to Bas Obispo, a distance of five miles, by small canals or diversions, which carried into the Chagres River the water from streams that otherwise would have flowed into the Cut and interrupted the work. To prevent the water in Gatun Lake from backing up into the cut the earthen dike which was blown up on October 10, 1913, was built. To the south of Gold Hill the water which would have flooded the Cut was carried off by the Rio Grande and an old French diversion channel. Rain water that collected in the Cut flowed north and south. At Gamboa, on the north, it was pumped through the dike, and at Pedro Miguel, to the south, it drained off through the lock wall culverts.

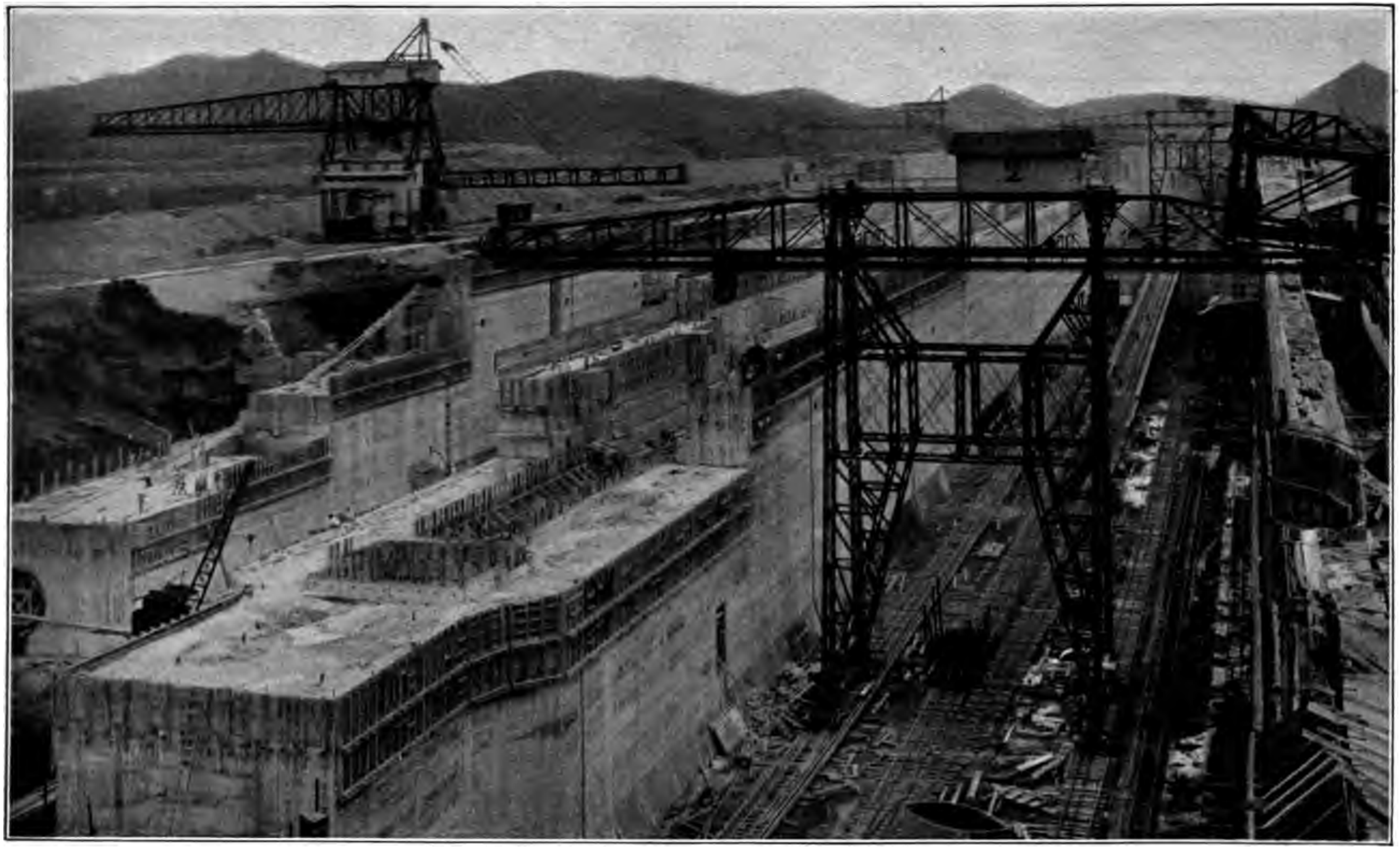
All steam shovel work in the Cut was discontinued on September 15, and between that date, and October 5, 1913, when water was admitted, all equipment and other material, including over 36 miles of construction track, was removed. At that time there were about 30 steam shovels at work. The following table of material excavated in the Cut and for the whole canal, indicates the period of preparatory work, the time when the highest point of effi-



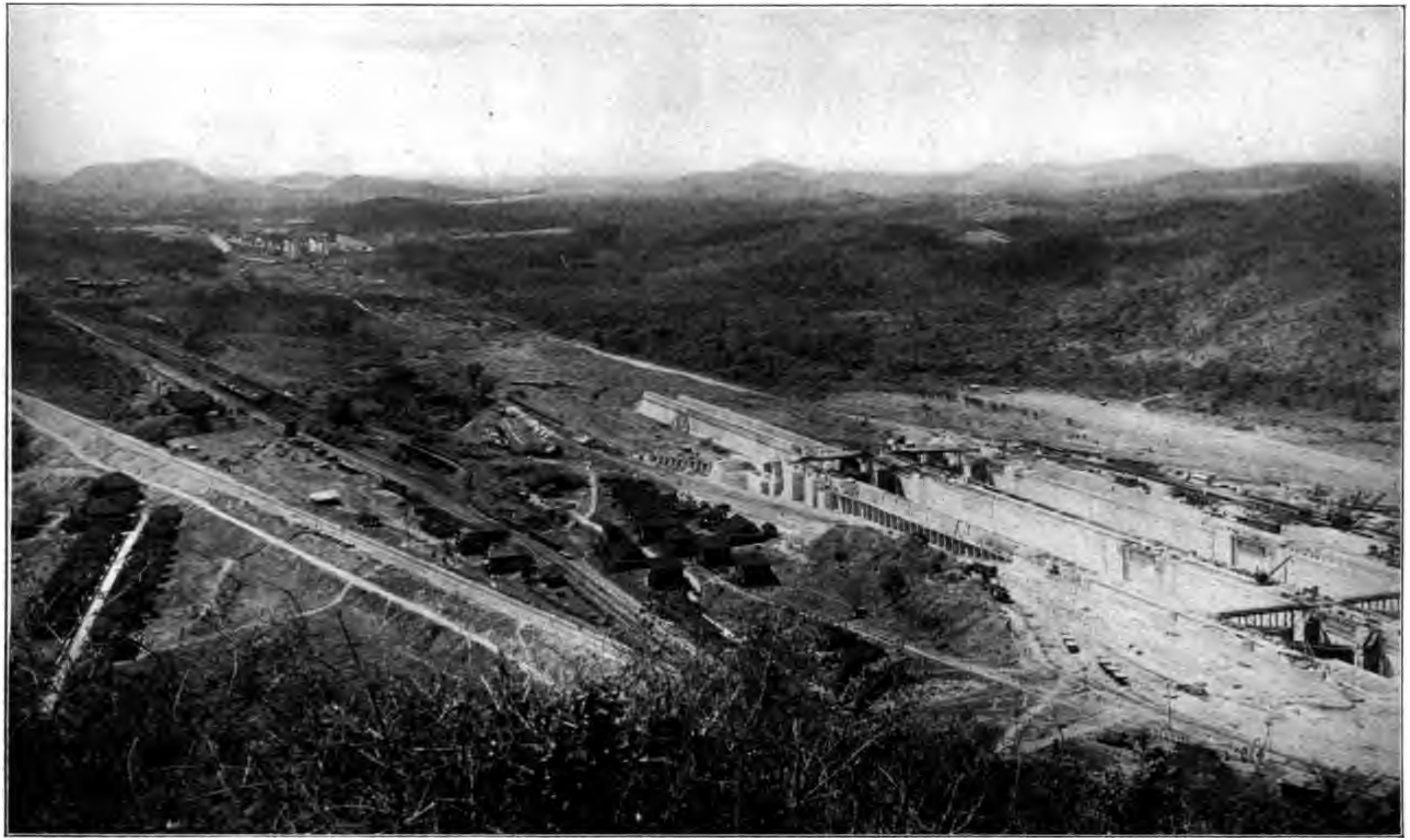
Section of lock wall showing the rack rail over which the towing locomotives travel.



Towing locomotive in operation at Gatun Locks. These machines are designed to tow vessels through the locks. There will be two locomotives ahead towing, and two astern to retard the vessel's progress if required. In towing, they will not move faster than two miles an hour, but a second or return track, permits them to go back at greater speed.



A comprehensive view of one of the great locks of the Canal under construction, where the largest concrete monoliths in the world have been built. One is almost bewildered by the tremendous machinery of the work—the enormous Berm and Chamber cranes with their almost uncanny air of intelligence towering over the scene with their interlaced-ironwork arms extended above the cement walls which they are constructing.



Pedro Miguel and Miraflores Locks are about one and one-half miles apart. This birdseye view gives an idea of their relation to each other. The Pacific entrance to the Canal and Ancon Hill may be seen in the distance. The newly relocated line of the Panama Railroad, which divides the town of Pedro Miguel into two parts, is visible in the foreground at the left of the locks. The space between the two locks is now filled with the water of Miraflores Lake.

5-yard dippers were used almost entirely, and a shovel thus equipped averaged about 1,800 cubic yards per 8-hour day. A cubic yard of earth and rock weighs about 3,600 pounds, and represents about a two-horse cart load. The work done by the steam shovels would dig a canal 55 feet wide and 10 feet deep from Maine to Oregon.

In transporting material to the dumping grounds three classes of cars were used—Lidgerwood flat cars with one high side with a capacity of 19 cubic yards, and Oliver and Western side dump cars, large and small, having a capacity of 17 and 10 cubic yards, respectively. To haul trains composed of 20 flat cars, 27 large dump cars, or 35 small dump cars, American locomotives were used. These trains would make an average of 1¾ trips daily to the dumps, an average distance one way of 11 miles. The average time consumed in unloading a train of flat cars at the dumps was from seven to 15 minutes. This was accomplished by the use of what was known as an unloading plow. The large dump cars were operated by compressed air from the locomotive, while the small dump cars were operated by hand, and the time consumed in unloading was from 6 to 55 minutes.

Boat landing at Gatun. The structure on concrete piles to the right is a wharf where small boats that ply the lake may land their cargoes, when the lake is to its full height.

The constant arrival of spoil trains on the dumping grounds made necessary a quick method of changing the construction tracks. This necessity led to the invention by W. G. Bierd, formerly superintendent of the Panama Railroad, of a track shifting machine. This machine consists of a boom, extending from a flat car out over the track in advance of the car, to which a block and tackle is attached by which the track is lifted from its bed. Another boom extending from the car at an angle with the main boom pulls the track to one side or the other. In this way track may be thrown nine feet from its original position in one operation.

In addition to the unloading plow and the track shifter for the rapid handling of spoil, there was also used a machine to spread the material on the dump and keep them in a uniformly level condition. This spreader consists of a car on which has been placed a machine with steel wings, and it works exactly like an electric snow plow on the city streets in the United States, with the exception that the wings are operated with compressed air obtained from the locomotive which hauls the car over the dump. With a perfect organization, modern equipment, a well planned system of transportation, and the rapid disposal of the spoils on the dumps, the maximum possible output of the steam shovels was obtained and maintained, and many world records were made on the Isthmus in excavation work.

ACROSS THE ISTHMUS IN A HYDROBIPLANE

Several attempts have been made during the past few years to cross the Isthmus in a heavier than air flying machine, but none were successful until April 27, 1913, when Robert G. Fowler, the aviator, accompanied by R. A. Duhem, photographer left the Pacific entrance to the Canal at 10 a. m., and arrived at Cristobal Point on the Atlantic side at 10:57 a. m. The route of the canal was followed closely, the aviator making a circle at Culebra, in order to obtain views of all parts of Culebra Cut. The highest altitude attained during the flight was 1,800 feet; the lowest height at which the machine flew was 400 feet. The President has since signed an Executive Order prohibiting further flights over the Canal, or to take photographs from a flying machine, without written authority of the Chief Executive of the Canal Zone.

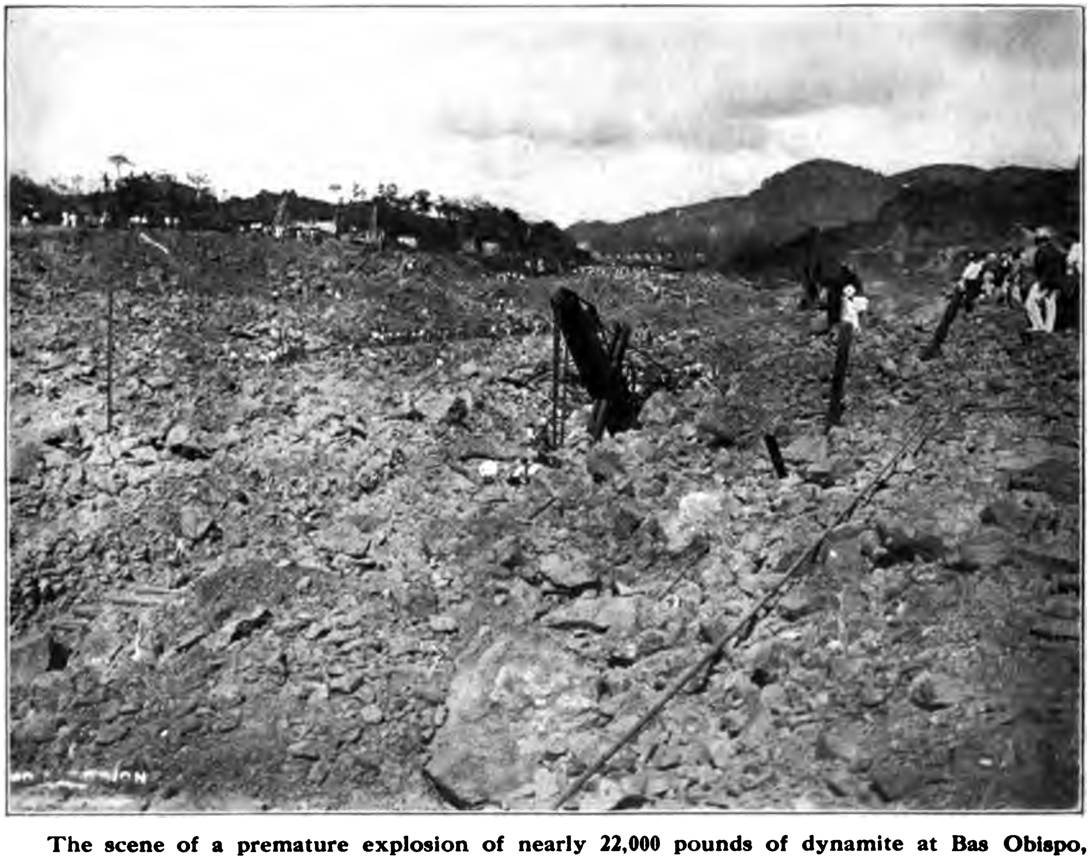
Robert G. Fowler's hydrobiplane passing over Culebra Cut. Empire suspension bridge in foreground. A rare picture.

Crossing the Locks at Gatun on a bucket operated by the cableways.

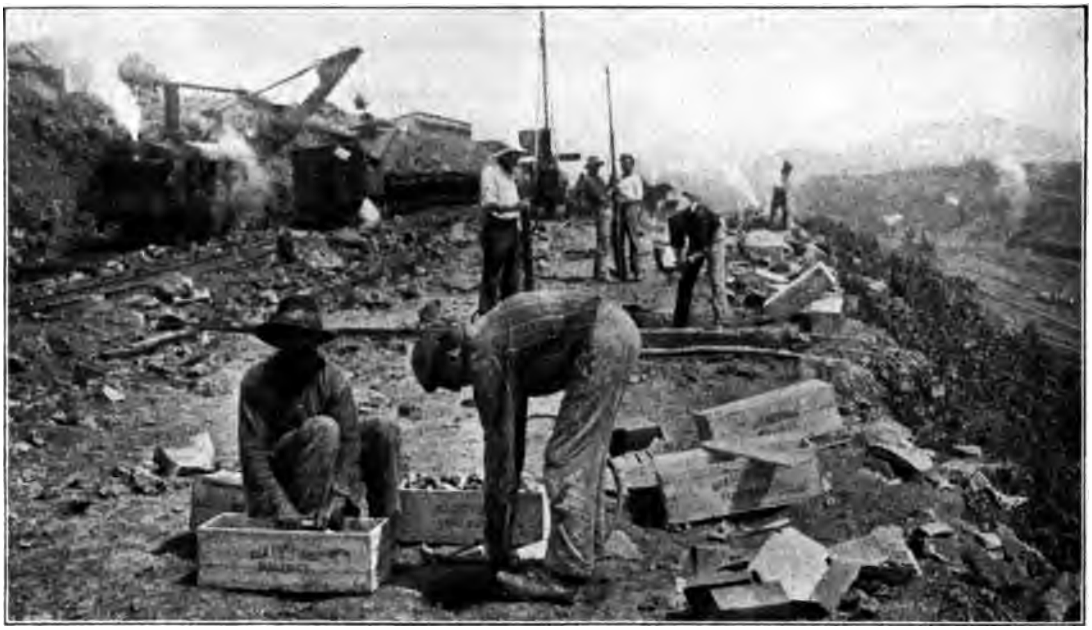
"On they struggled, ever onward,
Blasting stone, and earth and men;
Filling rivers with razed mountains;
Filling graves with parts of men.
Blood and bone are mixed with concrete,
Sweat of brow and grime of toil
Mark the rough-neck as he swelters,
Weary 'mid the grease and oil.
Weary flesh, nor fever's terrors
Halt them as they onward go.
Forward! Forward! Ever Forward!
Is the only cry they know."
—*John Hall.*

SEVENTY MILLION POUNDS OF DYNAMITE

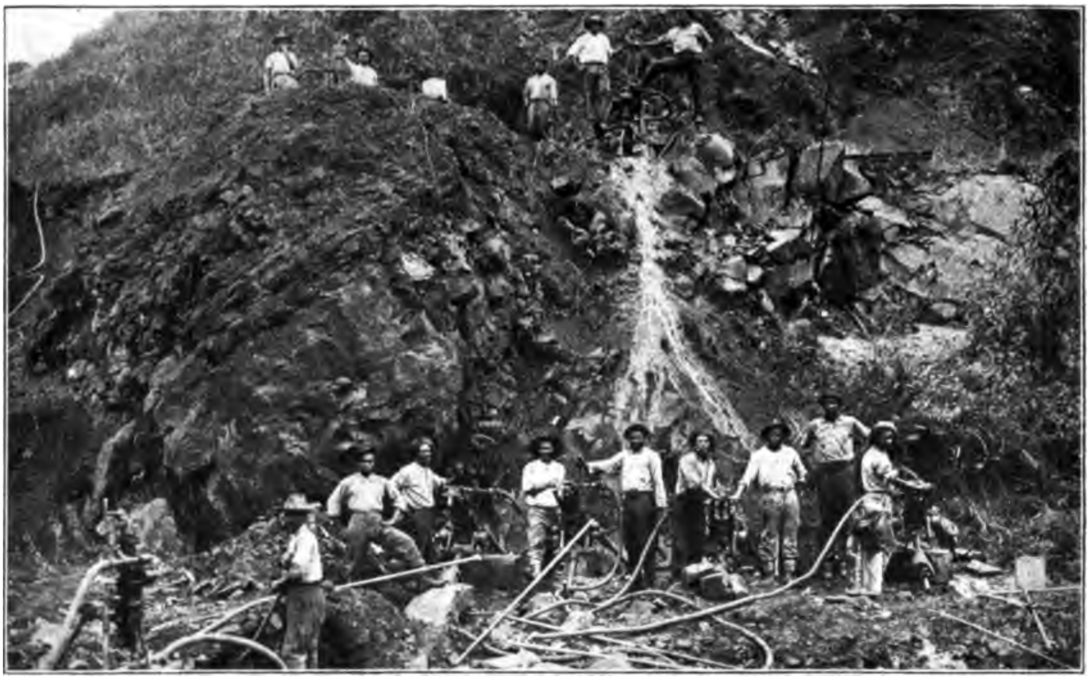
The greater part of the material excavated by the Americans in Culebra Cut before the dredges were introduced consisted of hard rock, and it was necessary to drill and blast it before it could be handled by the steam shovels. About 50,000,000 pounds, out of a total of about 70,000,000 pounds for the entire Canal was used. When it is considered that nearly three cubic yards of



The scene of a premature explosion of nearly 22,000 pounds of dynamite at Bas Obispo, December 12, 1908. About 50 men were injured and 26 were killed, among them being three Americans. Blasting operations are conducted with great care, and the heavy shots are usually fired off after the men have quit work for the day, although several of these premature explosions have occurred.



Laborers loading well-drill holes with dynamite near Contractor's Hill. A small charge is first exploded, enlarging the hole at the bottom. Then the main charge, usually consisting of from 75 to 200 pounds is placed, and exploded by means of an electric light wire.



A group of tripod drills at work. Churn drills are used also. All drills are operated by compressed air supplied through mains, and an average of 75 miles of drill holes is sunk each month.

material are blasted for each pound of explosive used, the important part dynamite has played in canal construction can be readily seen. Blasting powder was not used to a great extent due to excessive moisture and water in the holes.

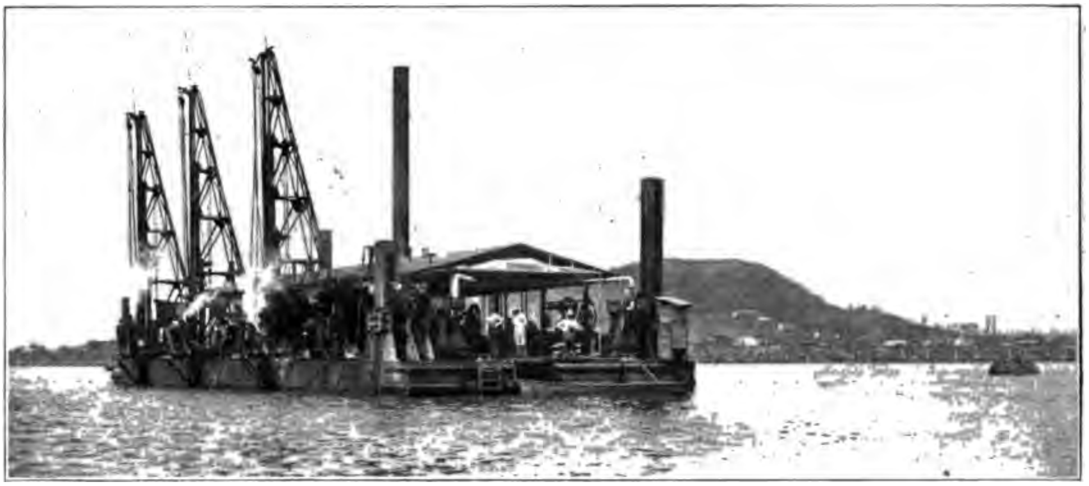
In order to keep the steam shovels going at capacity, it was necessary to blast large areas at a time and as much as 26 tons of dynamite was used at one time. In the use of such large quantities of high explosive there have naturally been many serious accidents although extreme care was taken in the handling. The most serious accident occurred in the Cut at Bas Obispo on December 12, 1908, when there was a premature explosion of nearly 22,000 pounds placed in 52 of the 53 holes it was intended to explode. The powder gang was working on the last hole when the entire charge for some unknown reason went off. The result was appalling. Twenty-six men were killed, among them being three Americans, and some 50 injured, many of them seriously. There had been a premature explosion of 26 tons a few months previous, May 22, 1908, in the Chagres section of the Canal, which is supposed to have been caused by lightning. There were few casualties, however, although there were many narrow escapes as several hundred men were in the immediate vicinity. The thing most dreaded by the steam shovel men, with the possible exception of a sudden slide of rock, was the chance of the shovel digging into a charge of dynamite which had failed to explode. An accident of this nature occurred in the Cut on October 8, 1908, with the result that five of the shovel crew were killed and several injured. A few days later another premature explosion of over 24,000 pounds in 154 holes caused the death of eight men. This latter accident was also attributed to the action of lightning upon the wires which, although connected with the holes, were not carrying any electric current at the time.

Twelve of these magazines for storing dynamite are located at convenient points along the Canal.

To prevent such accidents as much as possible, many lectures and discussions were held from time to time among the employes engaged in the handling, storage, etc., of explosives. Representatives of the Nemours-DuPont Powder Company, which supplied a large part of the blasting material, explained the making of dynamite, the right method of handling, and its action under certain known conditions. As a result of these

A giant blast in Culebra Cut.

discussions, it was decided to use a high amperage current from an electric light plant in exploding charges of more than a dozen holes, instead of by the use of storage batteries. Under the latter method, with the holes wired in series, instead of in parallel, there was no certainty that all the holes had exploded after the current was turned on. In addition to the use of a strong current, the holes were placed closer together, in order that the detonation from a nearby hole would explode those which would otherwise have failed to go off. Stringent rules and regulations for the handling, storage and use of dynamite were also introduced and enforced to minimize the danger. But no rules or regulations could prevent all accidents without cooperation of the men engaged on the work. This impossibility was forcibly demonstrated in the case of a Spanish laborer who, becoming impatient at the slowness of a negro helper, started to knock the cover off of a box of blasting caps with a machete. It is hardly necessary to say that he did not complete the work assigned to him.



In dredging operations, subaqueous or under water blasting is employed. Drill boats, like the one in the picture, sink the holes in connection with this work.

In making the necessary holes for the charges, tripod and well drills, obtaining their power from a compressed air main, were used. At one time there were as many as 377 of these drills at work in the Cut, and they were operated in batteries of from four to 12 drills. The usual depth of the hole drilled was about 27 feet, placed about 14 feet apart, and if all the drill holes necessary for the work were placed end to end, they would equal the length of the earth's diameter from pole to pole with 1,500 miles added. After the holes had been drilled they were widened at the bottom, or "sprung," by a small charge being exploded in them. After sufficient time had elapsed to allow the holes to cool, they were charged and wired. All blasting took place after the men had left the work for lunch or in the evening and at those times a naval engagement could be easily imagined by those living anywhere in the vicinity. At Porto Bello, where much powder was used in the quarrying of rock a series of blasts took place at one time when a British war vessel was passing close to the entrance of the harbor. Hearing what was thought to be the discharge of an Admiral's salute, the cruiser returned the supposed courtesy by dipping its flag.

In the Pacific entrance dynamite was employed in subaqueous blasting, two drill barges being used to make the necessary holes. In addition to breaking up hard material for the dredges in this section, the use of dynamite under water kept many of those employed in the vicinity supplied with fresh fish for some time. Those whose employment necessitated their going out in boats considered themselves particularly fortunate. On one occasion, a private mess of Canal employes was kept supplied with fish as long as such a diet could be endured by its members.

SLIDES—ELOQUENT ARGUMENT AGAINST SEA LEVEL PROJECT

The greatest difficulty in the excavation of Culebra Cut has been caused by slides which have from time to time precipitated great masses of earth and rock into the Canal prism burying steam shovels and dirt trains, tearing up dirt train tracks, and closing up the drainage ditch. There have been 22 slides and breaks at different times covering from one to 75 acres. These have added about 25,000,000 cubic yards, or about one-quarter of the estimated total of excavation necessary in the Cut. The largest and most troublesome of these is the Cucaracha slide on the east bank of the Cut at Culebra, which started in 1887 when the French were at work. When the Americans started operations in 1905, this slide again became active and, as the Cut deepened at this point, it continued to develop. Gold Hill presents a solid rock face 482 feet above the Canal bottom between Cucaracha slide and a slide immediately north. These two slides have broken so far back that the slope on their outer edges is away from the Canal. This has led to the introduction of hydraulic monitors which are engaged in sluicing the material from the top of the slides into the valley in the rear of Gold Hill, in order to reduce the pressure from above. Another serious slide occurred on the west bank of the Canal at Culebra covering an area of 75 acres, and necessitating the removal of about 10,000,000 cubic yards of material. This slide made necessary the removal of many buildings of the village of Culebra which were situated near the edge of the Cut.

Towing dynamite to the drill boat Teredo.

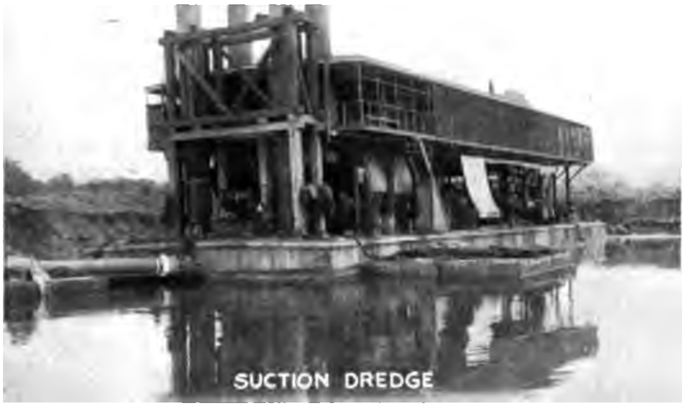
There are two classes of slides. One, similar to Cucaracha, is caused by the slipping of clay and earth on a smooth sloping surface of a harder material. The other, commonly called a "break," similar to the one which involved the village at Culebra, is caused by the steepness of the slope and the great pressure of the superincumbent material upon the underlying layers of softer material.

Besides sluicing, steam shovels excavated a great amount of material from the tops to relieve the pressure, and the Cut was terraced to prevent a part of the material in the slides from going over into the Canal prism. Many schemes were proposed to prevent slides, one, the use of a cement gun to spray the sides of the Cut where the mass of stone became brittle and crumbled on exposure to the air, but, as Colonel Gaillard said in November, 1912: "The only successful method of treating the slides or breaks, once the material is in motion, is to dig it out and haul it away until the slide comes to rest upon reaching the angle of repose for the particular material then in motion." No difficulty is anticipated with slides now that water has been let into the Cut as the back pressure of the water is expected to result in greater stability. What material remains in the slides in the prism will be handled by the dredges, which will continue their work until the "angle of repose" has been reached.

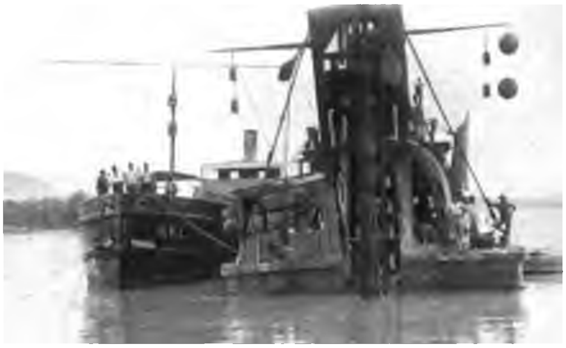
A subaqueous blast in progress in the Pacific entrance to the Canal. As high as 10,000 pounds of dynamite are shot off in a single blast of this kind.

The slides have caused an immense amount of extra excavation and many delays in the work, but they have demonstrated the fact that a sea level Canal requiring a Cut 85 feet deeper than it now is would be nearly impossible to accomplish. It is believed that the slides would have prevented the carrying out of a sea level project, except at an enormous expense.

SEA GOING DREDGE CULEBRA



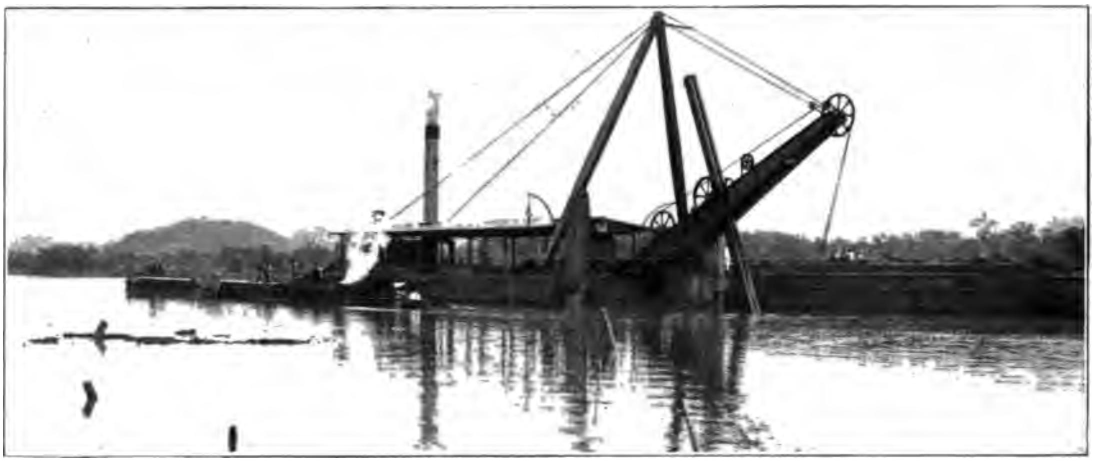
SUCTION DREDGE



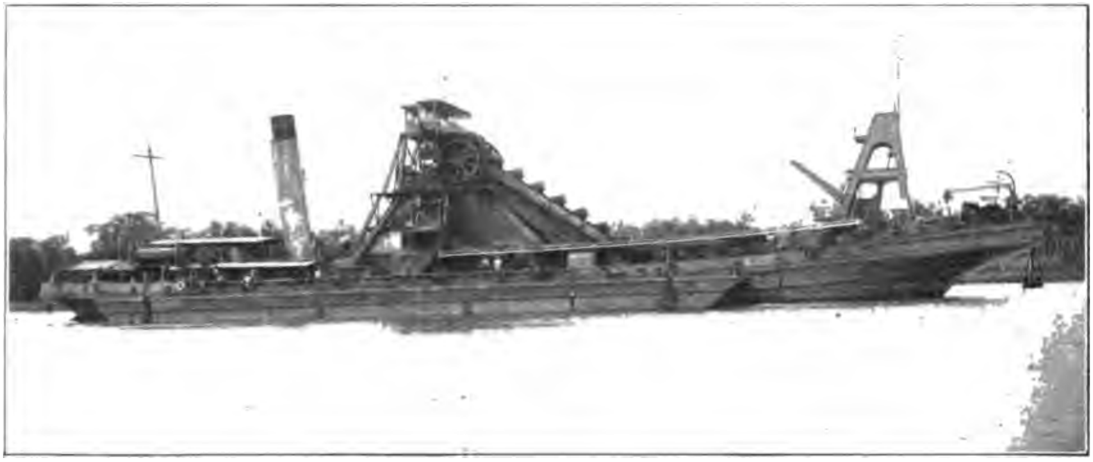
OLD FRENCH LADDER DREDGE

The sea going suction dredge Culebra, shown above, with its sister vessel, the Caribbean, constitute the most expensive units in the Commission's dredging fleet. These vessels move up and down the channel, sucking up the mud and loose material, conveying it into their own hoppers. When the hoppers are filled, the vessels go out to sea and empty. The suction dredges were used to advantage in the fill at Gatun Dam. Several of the old French dredges were repaired and used by the Americans.

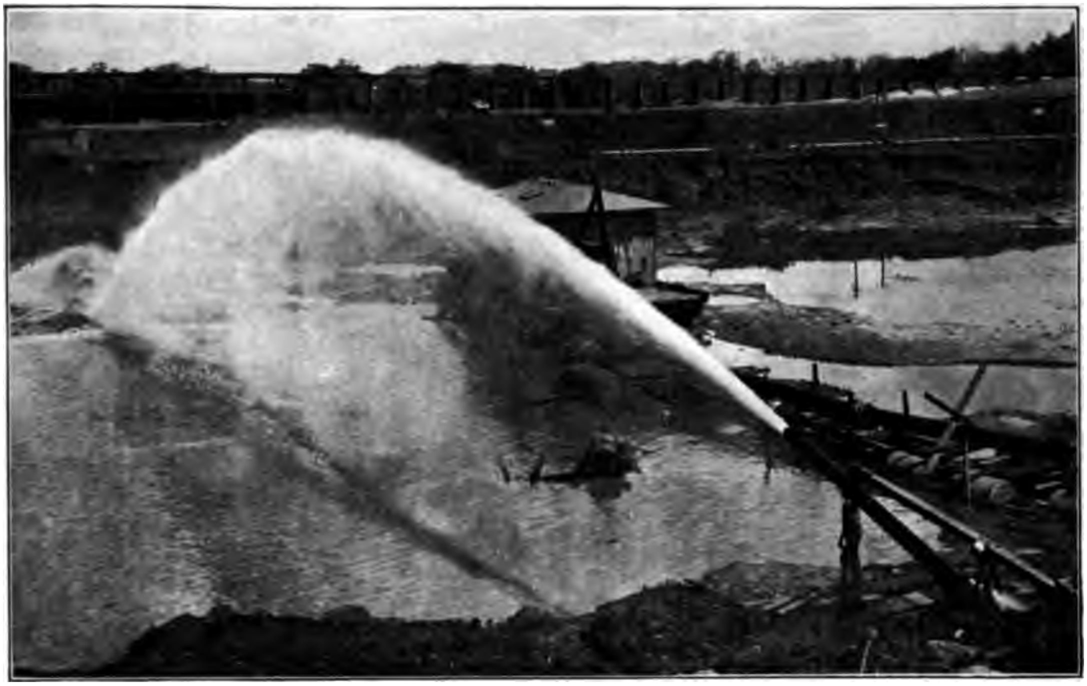
Suction dredge No. 82, removing silt from the channel north of Gamboa dike. This was the first dredge put to work in the Gatun Lake section.



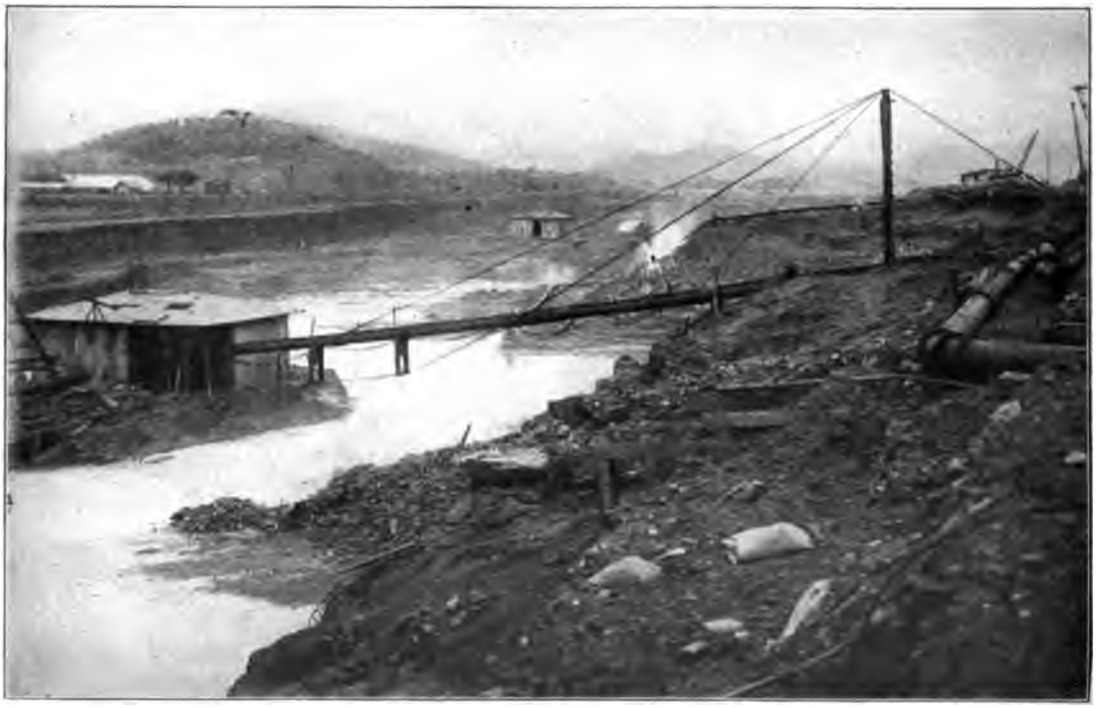
A dipper dredge at work in the Canal. The material is dumped into the barge along side the dredge, and when full the barge is towed out to sea and emptied.



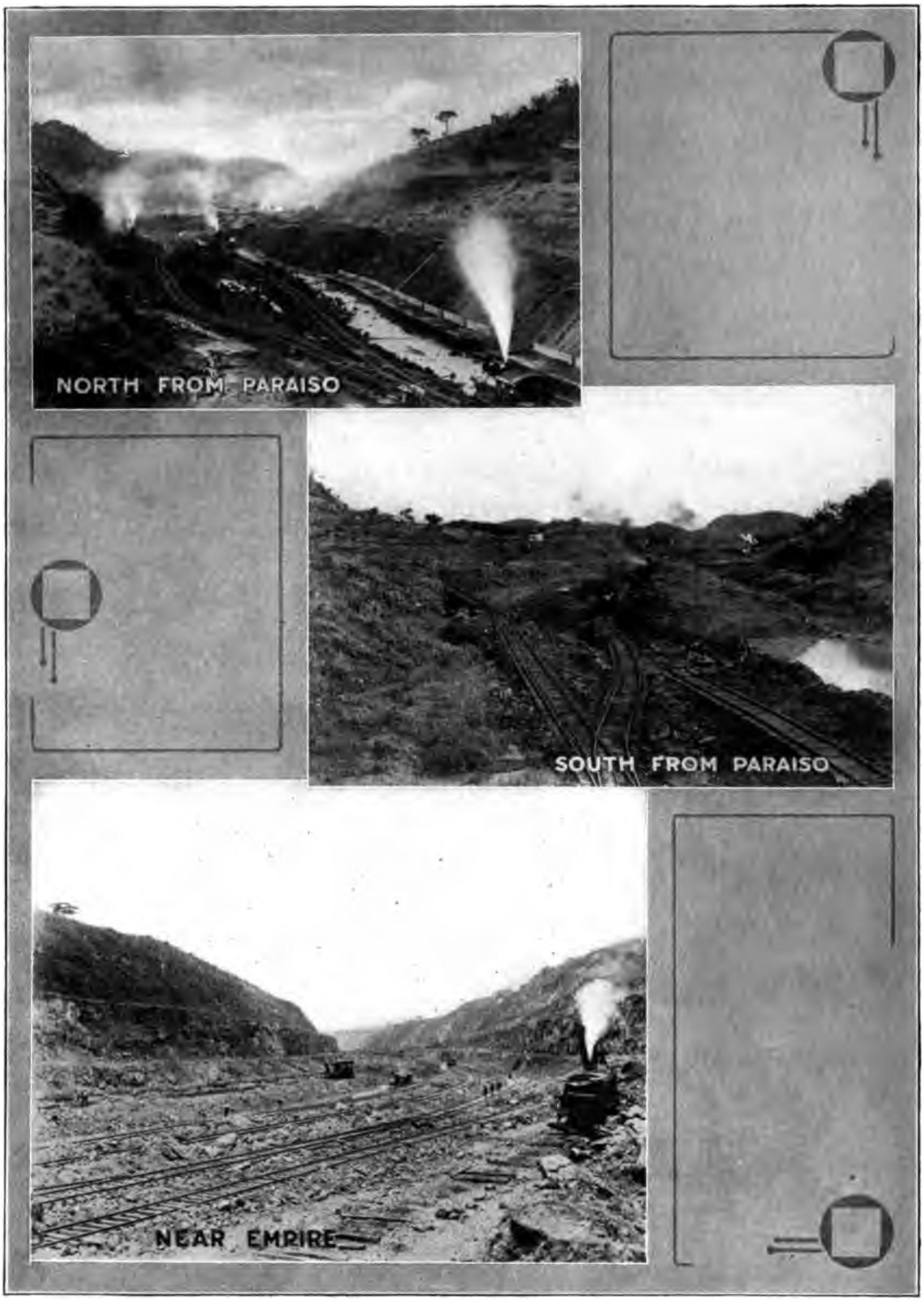
The Corozal, the newest and most modern ladder dredge in the Canal service. It is equipped with five yard buckets and can dig to 45 feet below mean sea level.



Part of Miraflores lock site and the Canal channel to the south of it were excavated hydraulically. This view shows one of the hydraulic pumps forcing the water through pipes, fitted with monitors, with a pressure of 130 pounds per square inch at the nozzle, which washes the material into pits or sumps.



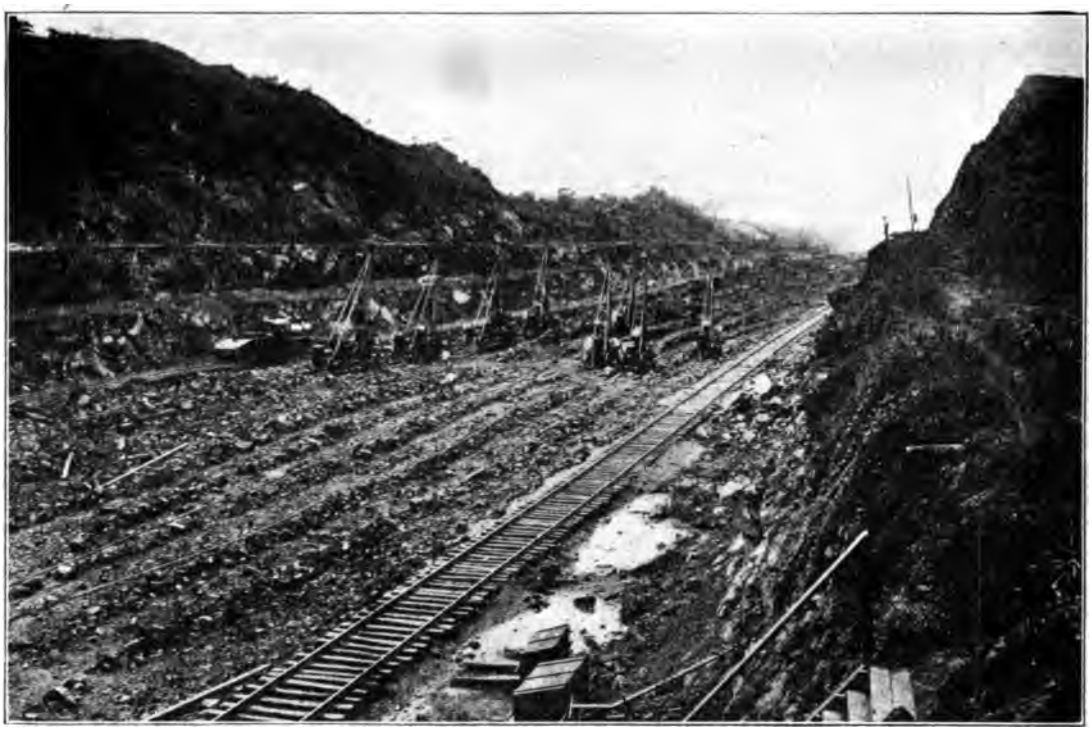
After the material has been loosened and washed into the sumps, centrifugal dredging pumps, shown here, force the material to the desired destination. Many acres have been reclaimed near Corozal by utilizing this excavated material.



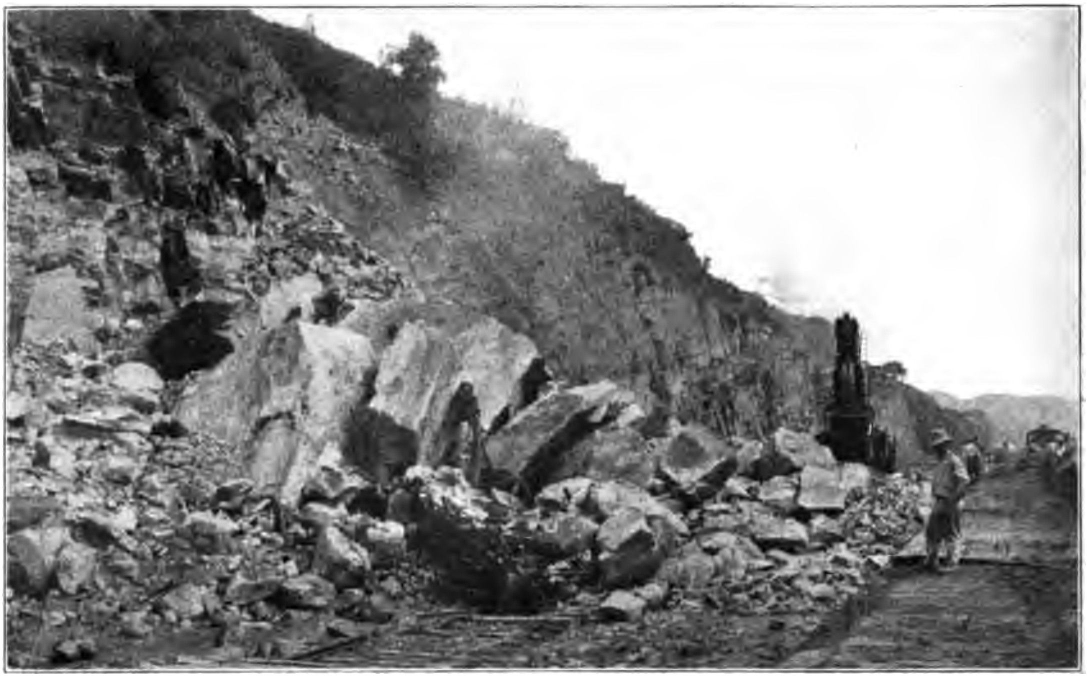
The upper picture shows a view of the Canal looking north from Paraiso bridge toward Gold Hill, showing work progressing in the Canal, August, 1908. The center picture is a view looking south from the same point, 1908, Ancon Hill in the distance. In the lower picture taken the same year, the Canal is shown near Empire. The suspension bridge near Empire may be seen in the distance.

Paraiso in the French days. This was the site of one of the locks in the 10-lock Canal scheme when the French were at work. On April 23, 1904, the United States made the memorable purchase at $40,000,000, and on May 4, 1904, the property was turned over to the Americans.

Paraiso in the days of American occupancy, showing Ancon Hill in the distance. The cranes which are also visible, show the beginning of the work at Pedro Miguel Lock. The French had none of the big tools, up-to-date machinery, steam shovels, cranes, etc., but with the equipment which they had they took out 78,000,000 cubic yards of spoil, of which 30,000,000 cubic yards was useful to the Americans.

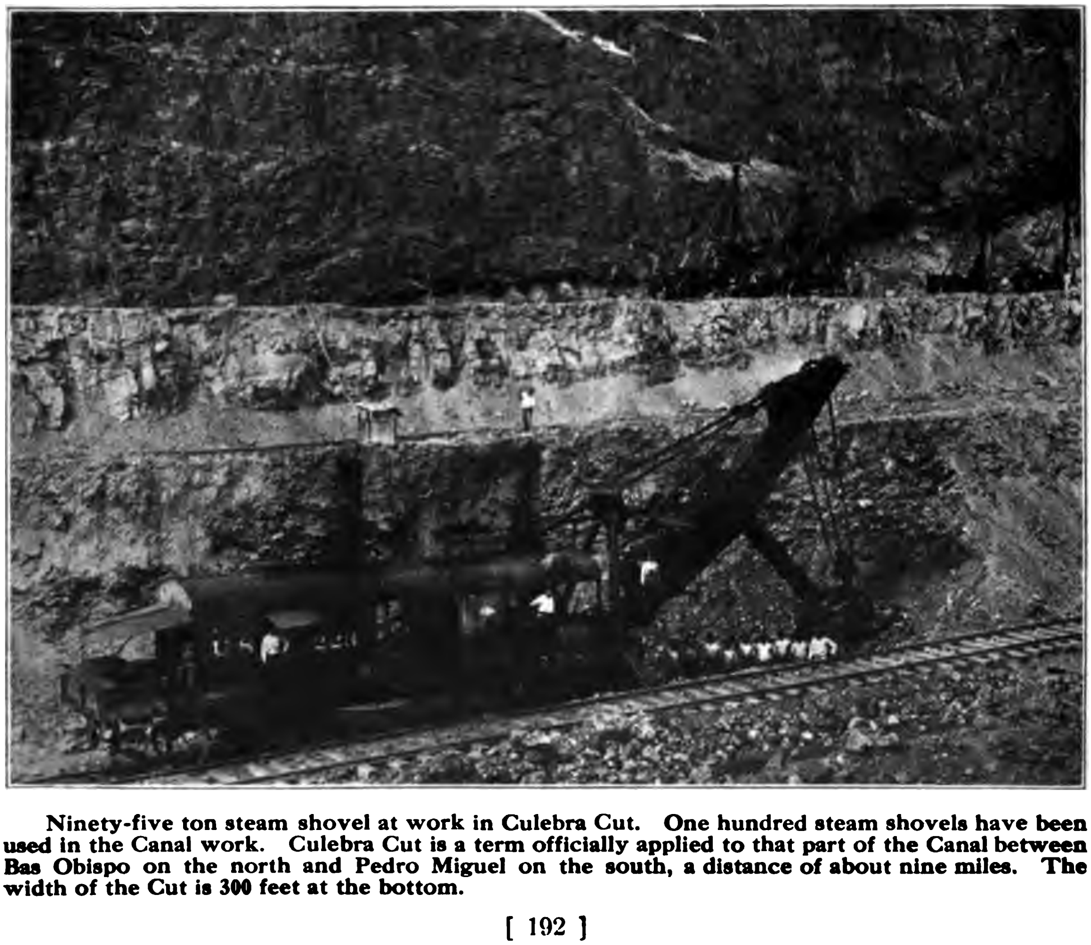


The Cut at Bas Obispo looking south June 30, 1910. The greater part of the excavating in this section had to be done through solid rock, and thousands of pounds of dynamite were used. It was in this section that the premature explosion occurred in 1908.

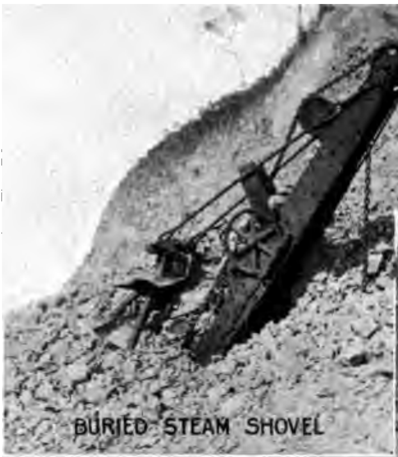


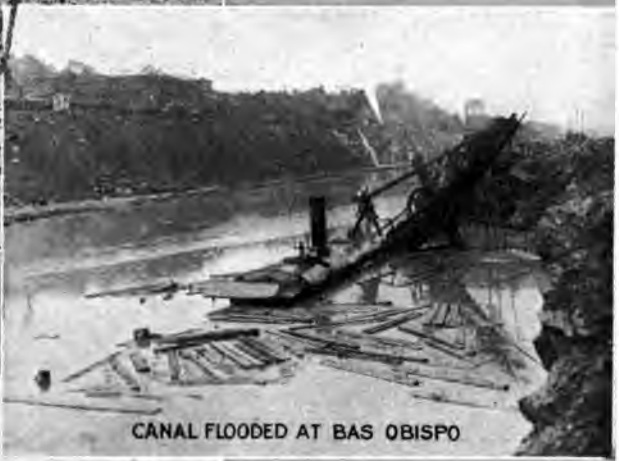
Steam shovel 218 buried under fall of rock, west side of Canal, near Las Cascadas. This shovel was working on the bottom of the canal when destroyed, May 31, 1912. Several steam shovels have been destroyed in this manner and a number of men injured and killed.

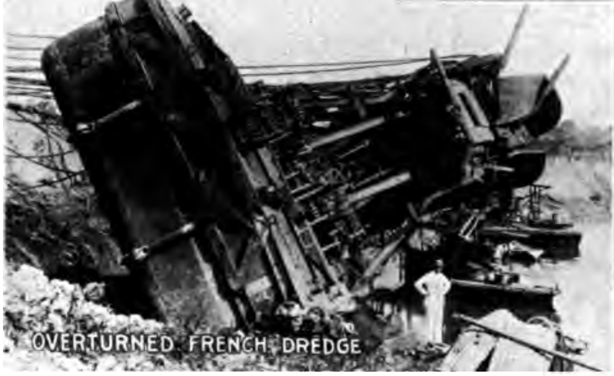
A close view of the suspension bridge across the Canal near Empire. This bridge is used for vehicles and foot passengers, but will be taken down when the Canal is completed. There will be no bridge aross the Canal, except the pontoon bridge near Paraiso, which will be swung over against the east side of the Canal when not in use.

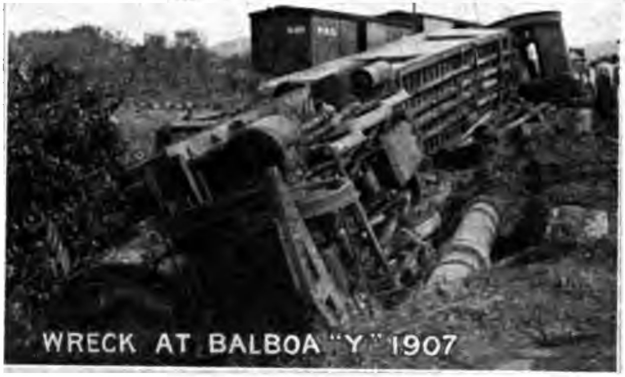


Ninety-five ton steam shovel at work in Culebra Cut. One hundred steam shovels have been used in the Canal work. Culebra Cut is a term officially applied to that part of the Canal between Bas Obispo on the north and Pedro Miguel on the south, a distance of about nine miles. The width of the Cut is 300 feet at the bottom.


BURIED STEAM SHOVEL

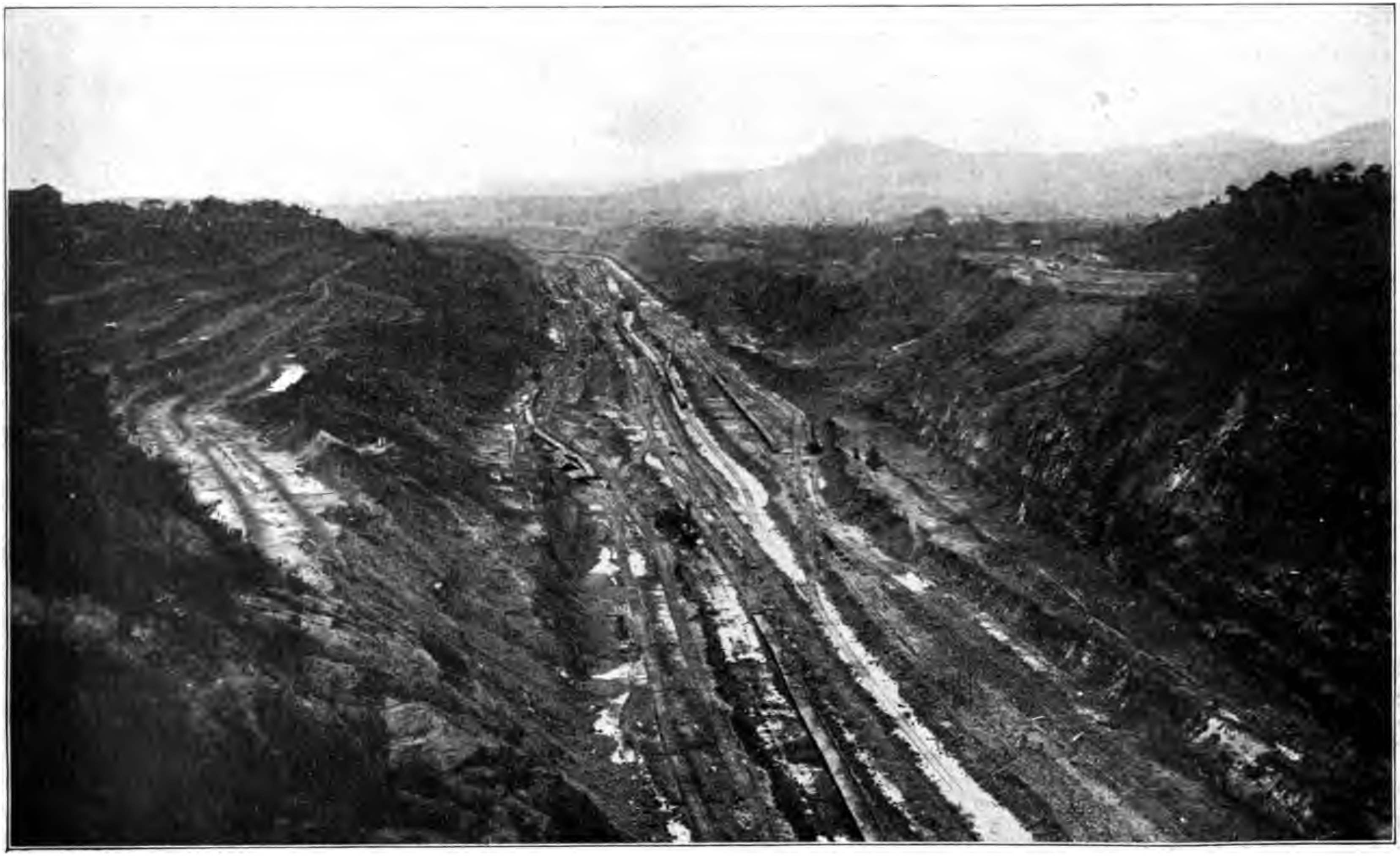

CANAL FLOODED AT BAS OBISPO


OVERTURNED FRENCH DREDGE


WRECK AT BALBOA "Y" 1907

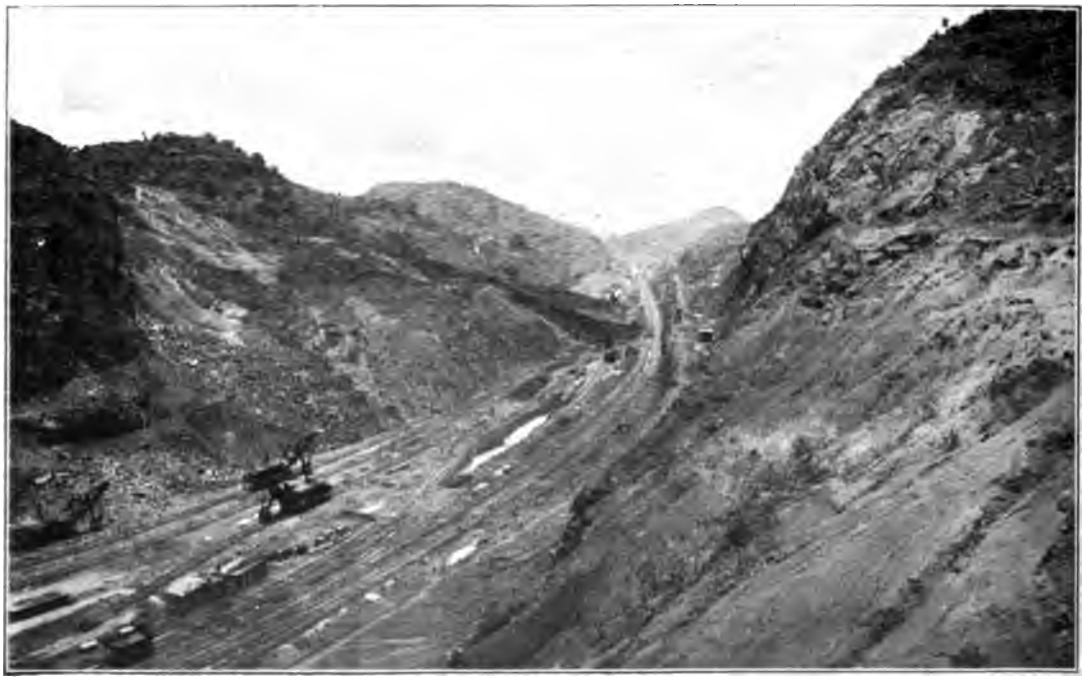
A great many difficulties have been encountered and overcome in building the Canal. The greatest difficulty in the excavating, was due to slides and breaks, which closed the drainage ditches, upset the steam shovels, and covered the tracks. The water that was not carried off by the diversion channels, entered the Cut, necessitating pumping.

The side of the Cut at Gold Hill, where the deepest cutting was done. When this photograph was taken the steam shovels had 30 feet further to go at this point.

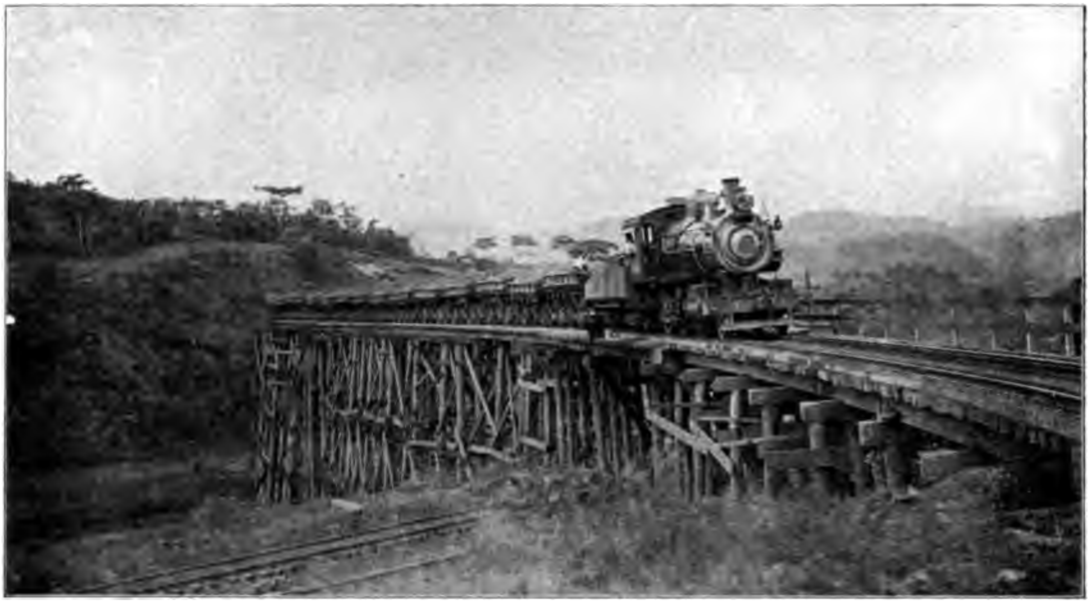


Culebra Cut near Culebra village, as it appeared October 1, 1912. You will note in the picture the manner of terracing the sides of the Cut. This was done as a preventive measure against the slides.

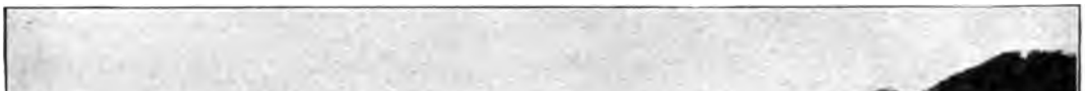
In the rainy season, two streams of considerable size originally crossed the route of the Canal in the Culebra Cut section, one of which was the Camacho River, now called the Camacho diversion. To prevent these streams from flooding the Cut, new channels were dug, paralleling the banks of the Canal, through which their flows were diverted. In this case it was necessary to dig a tunnel, which is shown above, to conduct the water through the hill.



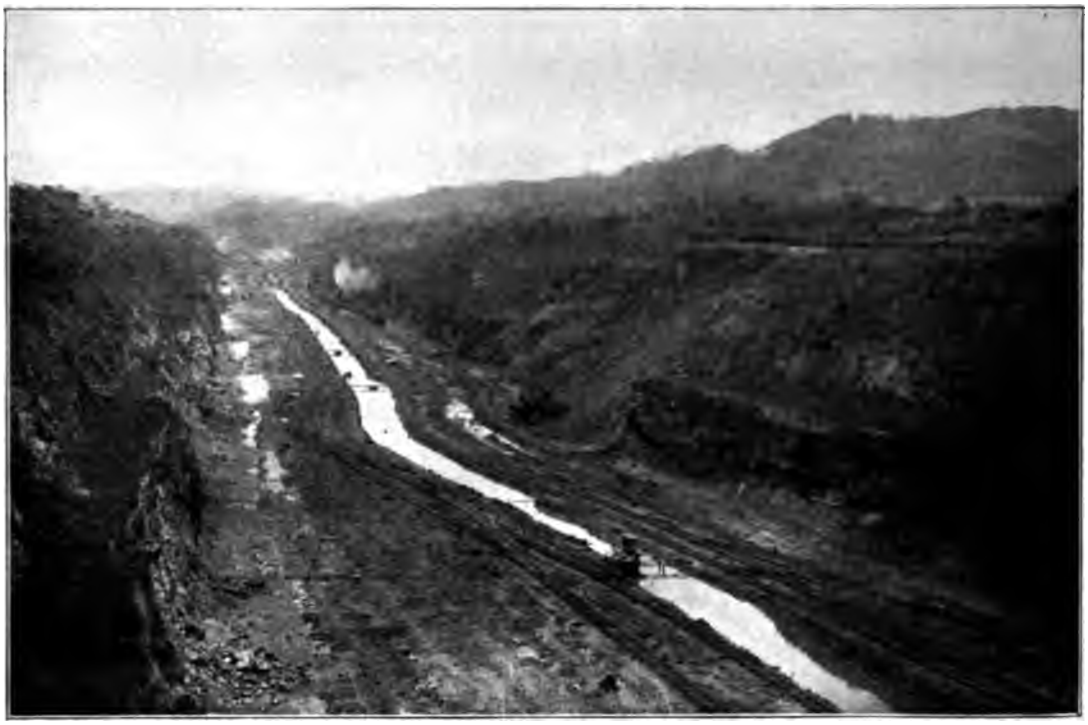
Culebra Cut looking south from Gold and Contractor's Hills taken at a time when the Cut was practically free of material brought in by Cucaracha slide.



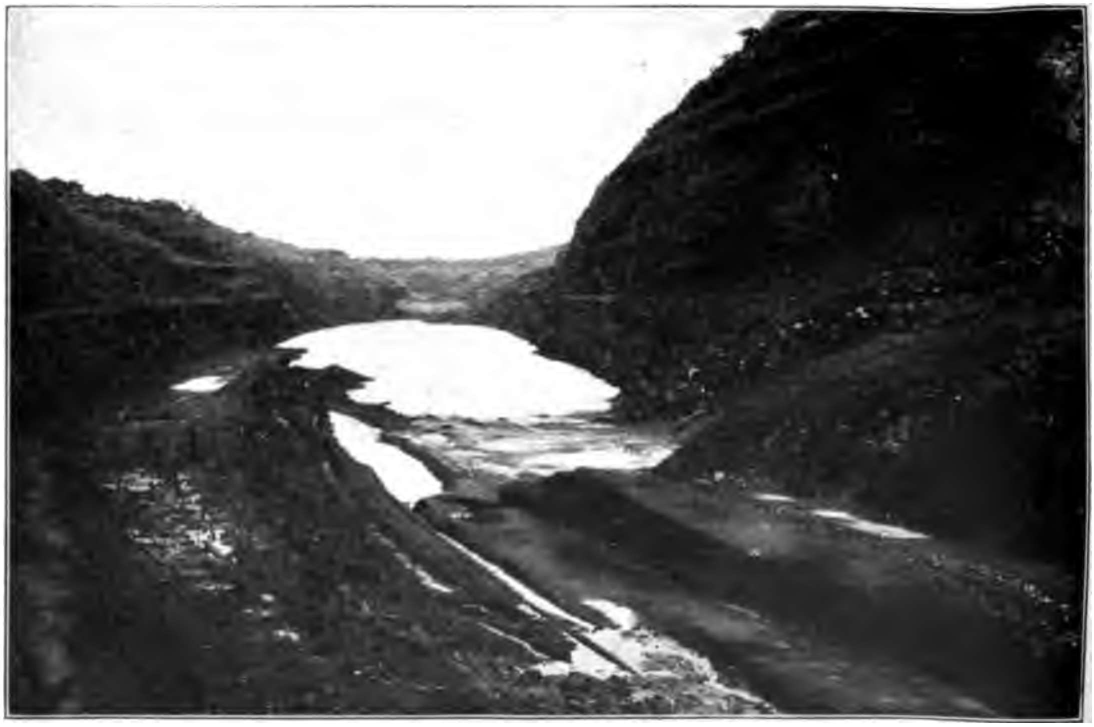
Loaded work train crossing the high trestle over the Canal at Paraiso. This bridge, known as No. 57½, is to be taken down as soon as the pontoon bridge a little above this point is constructed, as it obstructs navigation of the Canal.



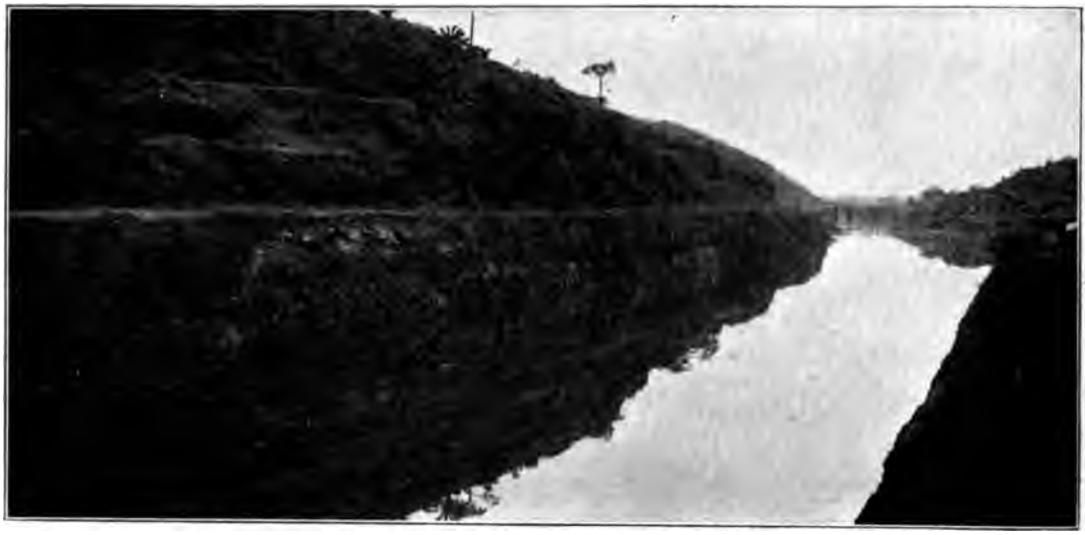
Section of Culebra Cut in the vicinity of Las Cascadas after completion. Various small slides have occurred all along the banks in this part of the Canal.



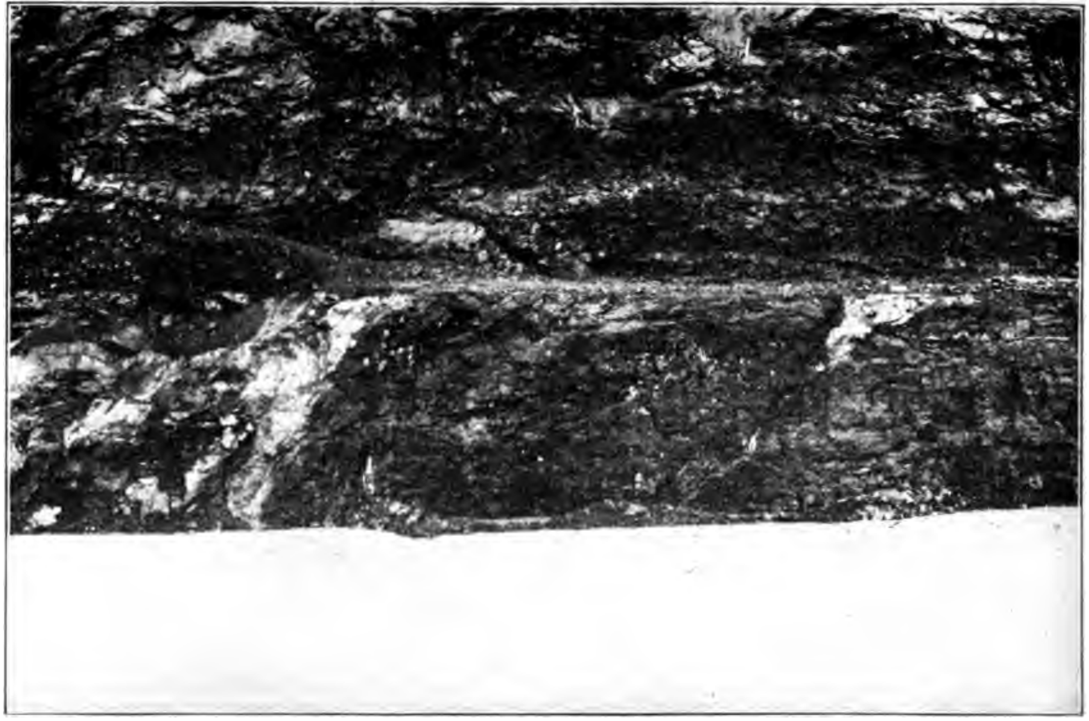
Completed section of Culebra Cut looking north from Cunette. Steam shovels are excavating in slide material. Bottom is to grade.



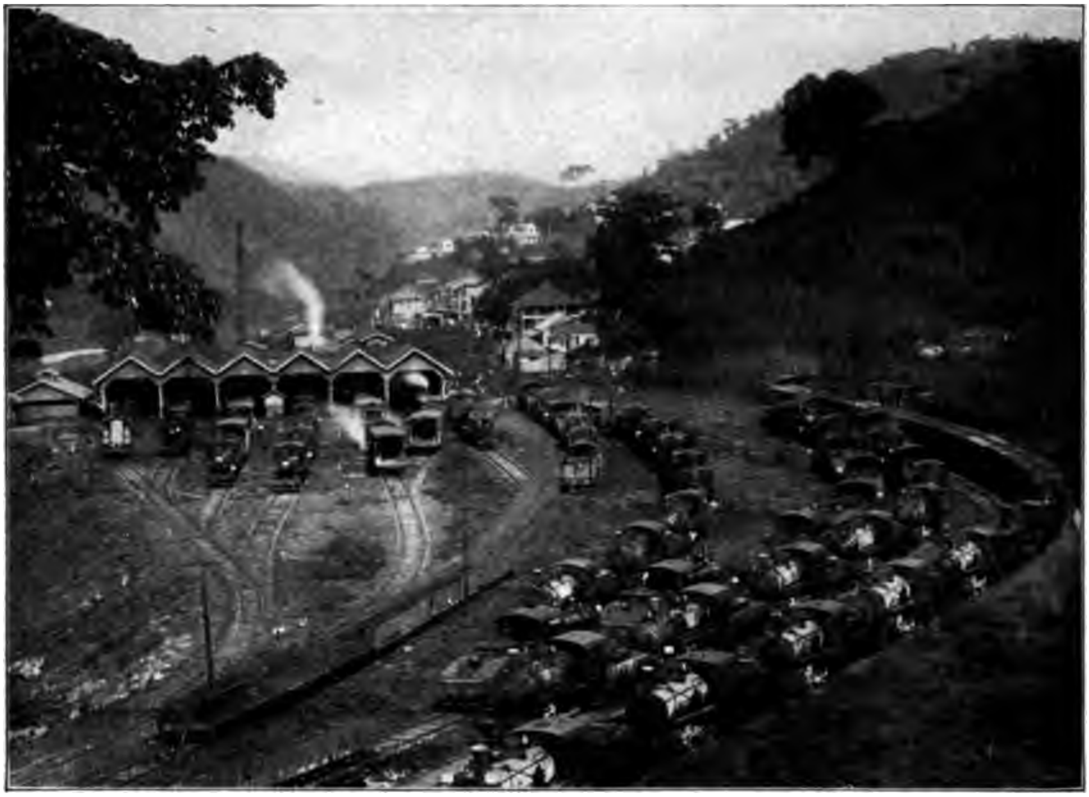
Culebra Cut between Gold and Contractor's Hills after the removal of construction tracks.



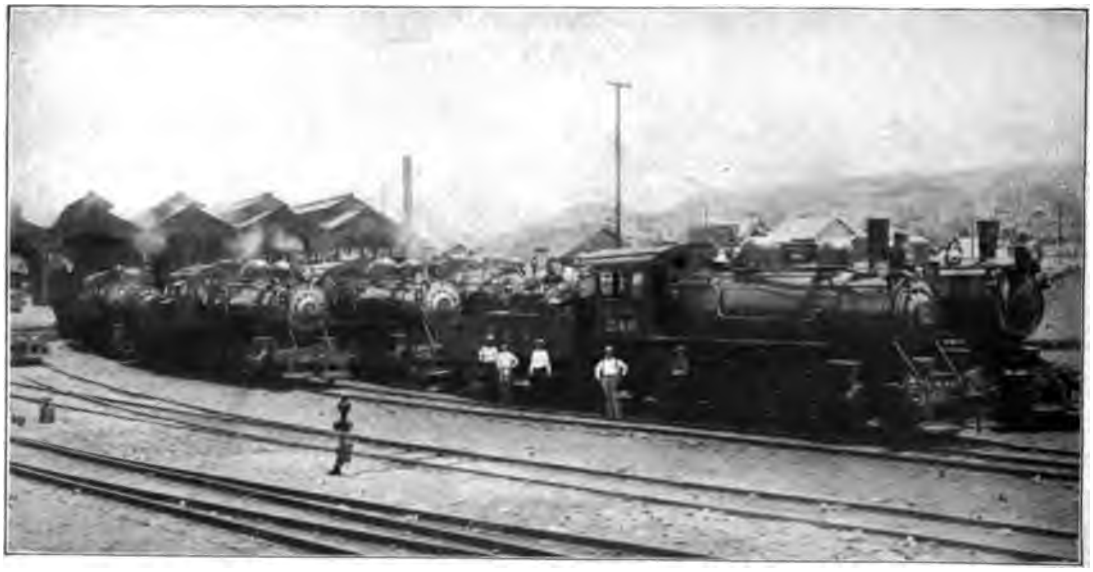
Culebra Cut, south of Cucaracha slide, after the channel began to fill.
Railroad crossing at Paraiso in the distance.



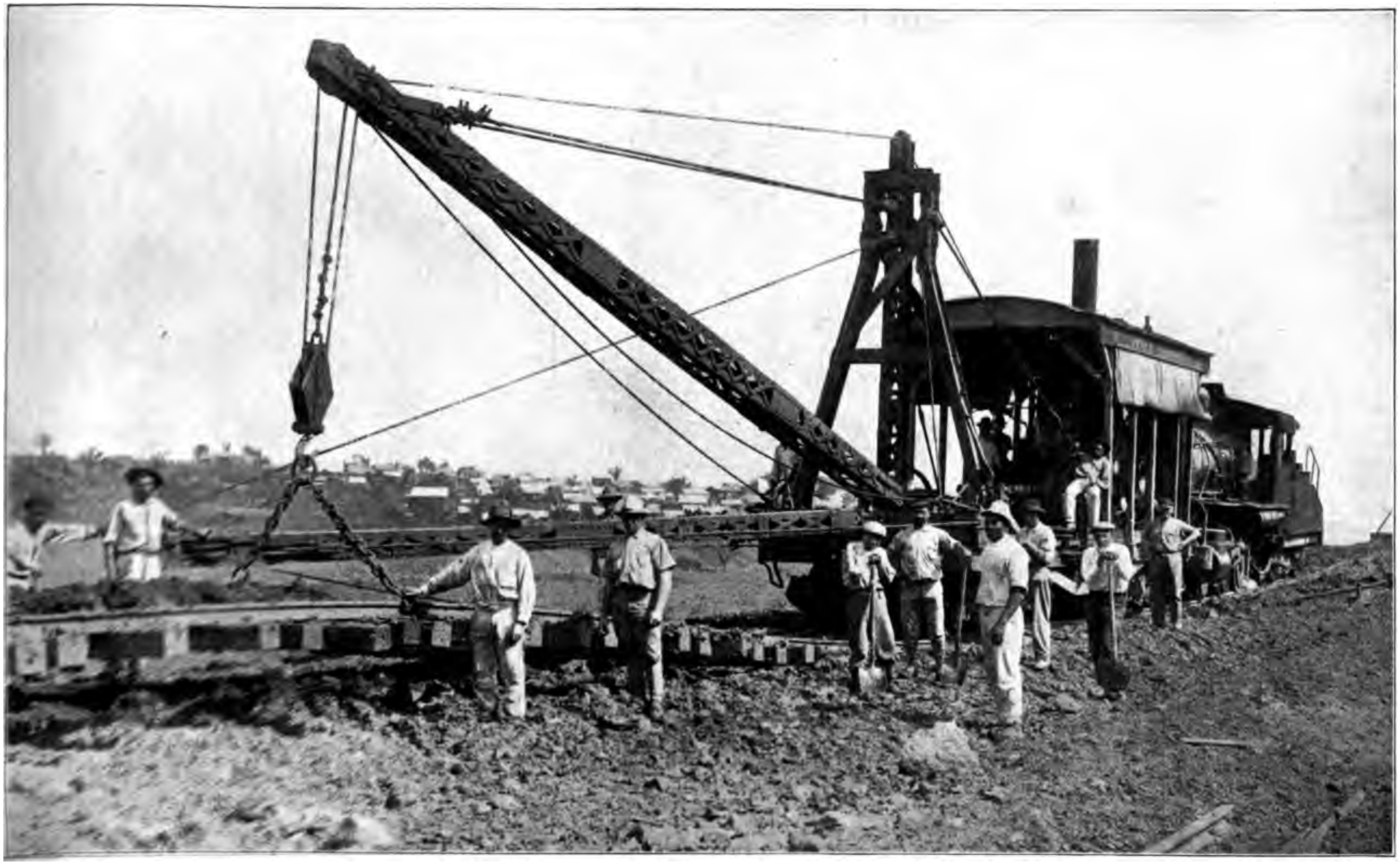
Close view of high rock bank of Culebra Cut after the water was let in. The thin white line about midway up the bank to the right marks the ultimate water level.



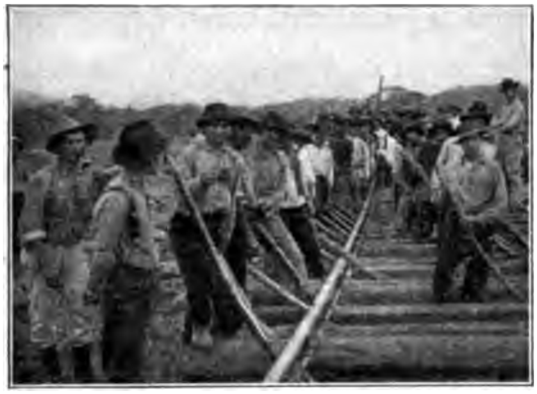
General view of engine house and yard at Paraiso in 1906. This yard was dismantled several years ago, and yards were established at Pedro Miguel and Las Cascadas.



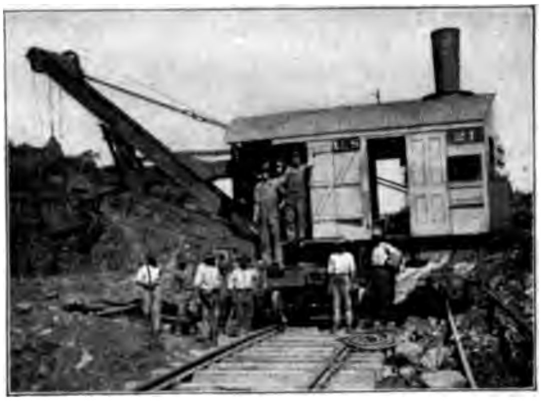
Engine house and yard at Las Cascadas. A very busy scene was presented in the morning when a hundred or more of the engines were leaving the yard to begin their daily work of pulling dirt trains out of the Cut to the dumping grounds.



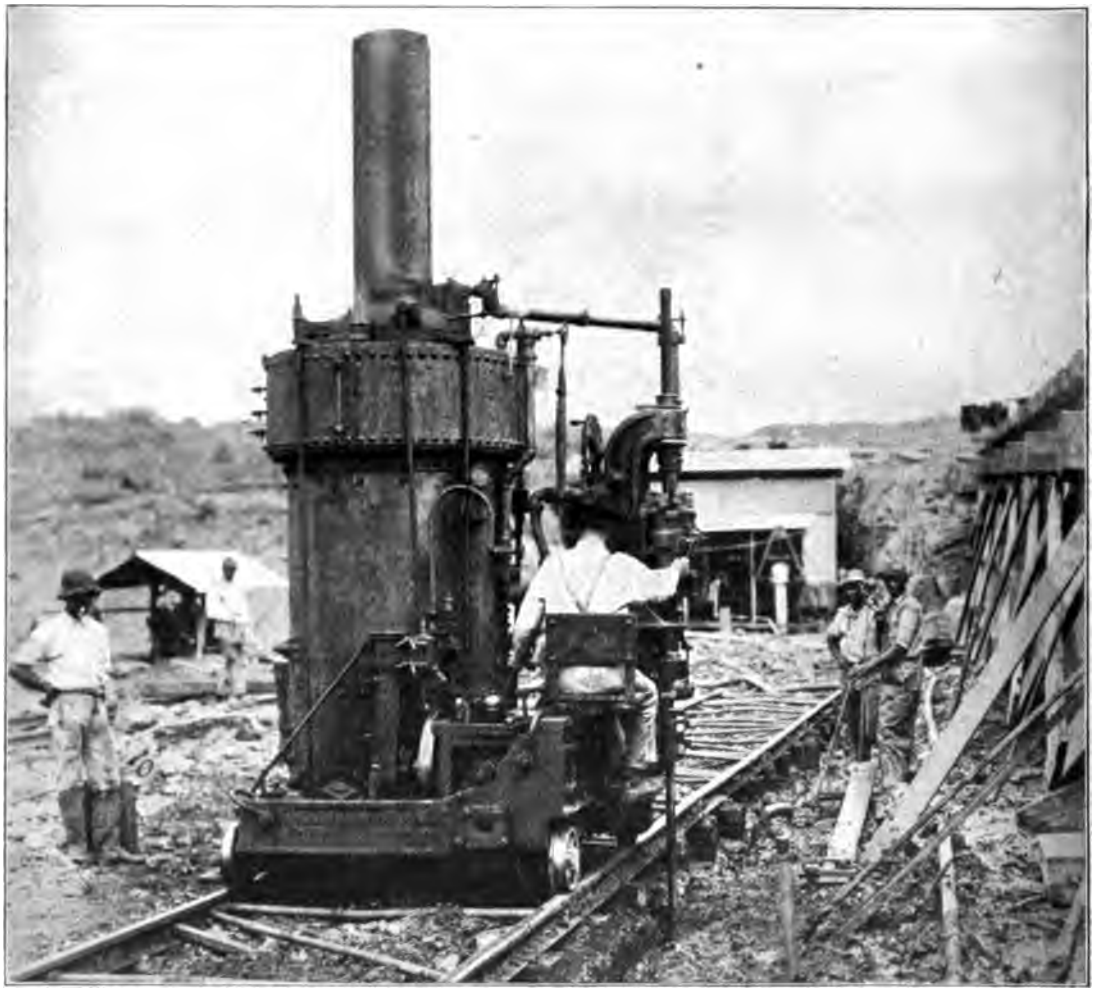
[illegible] machinery that brains could invent, or money buy, has been used on the Canal work. In many cases the practical [illegible] Canal engineers has been applied to various machines after purchase, with the result that a higher degree of efficiency has been [illegible] than their manufacturers guaranteed. Among the several inventions induced by the Canal work, is the track shifting machine, which lifts a section of the track, including the ties, with one motion, and by another, throws it from three to nine feet to one side. [illegible] the work of several hundred men.



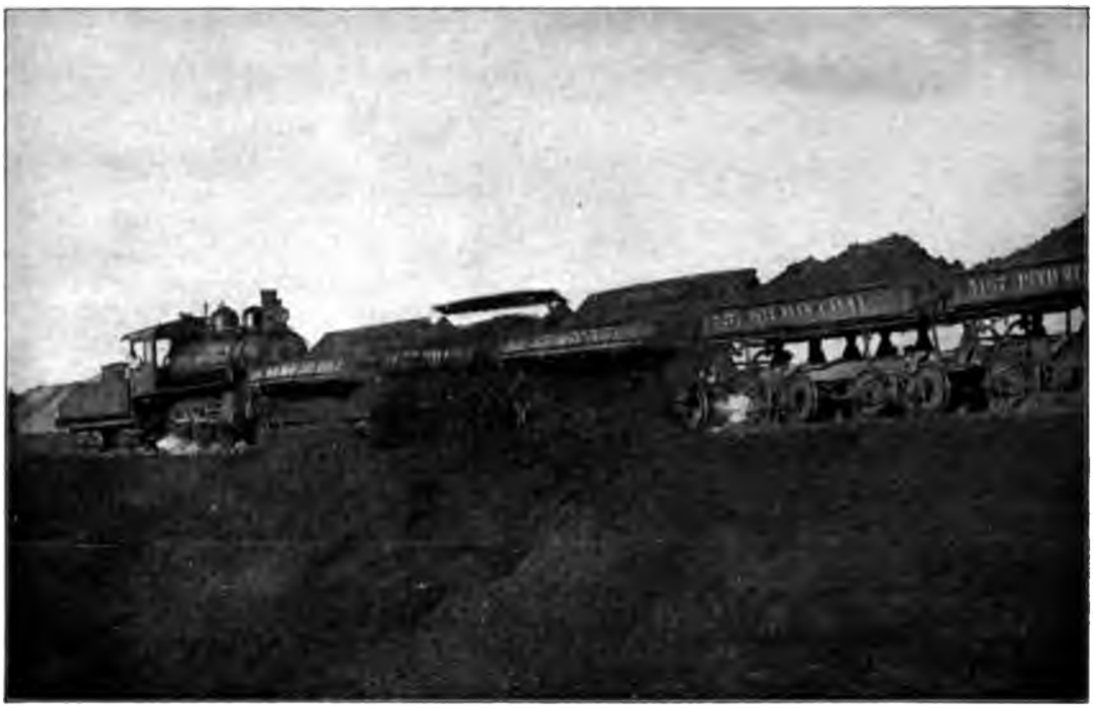
Men shifting track. The old way before the track shifting machine was invented, and put into use.



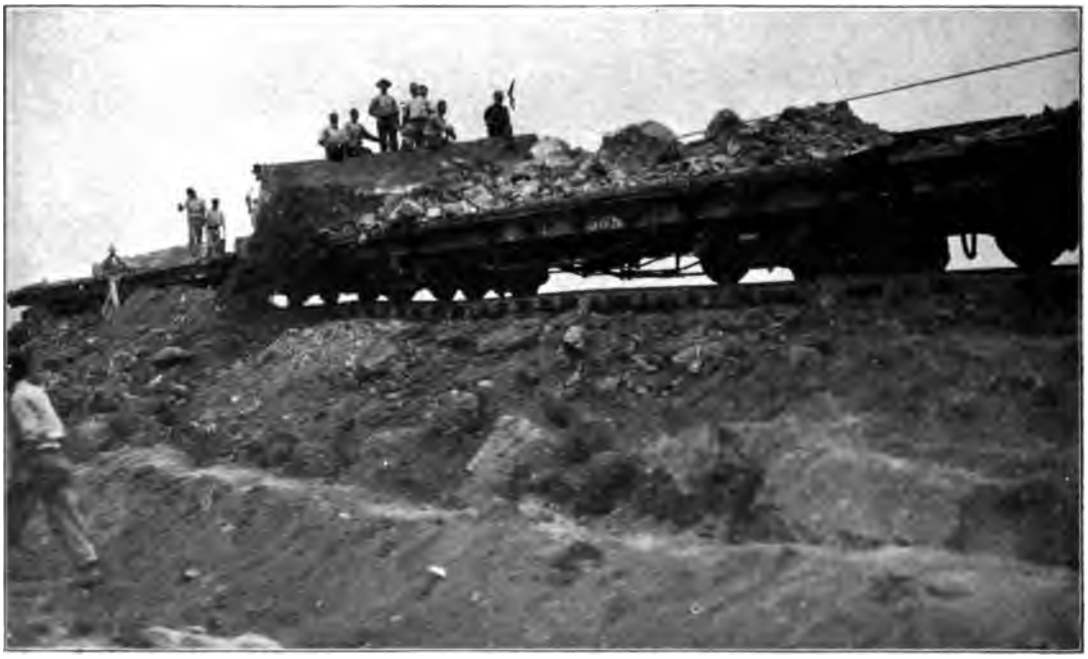
Revolving steam shovel. A few of these machines were used to advantage, but larger ones were used for the heavy work.



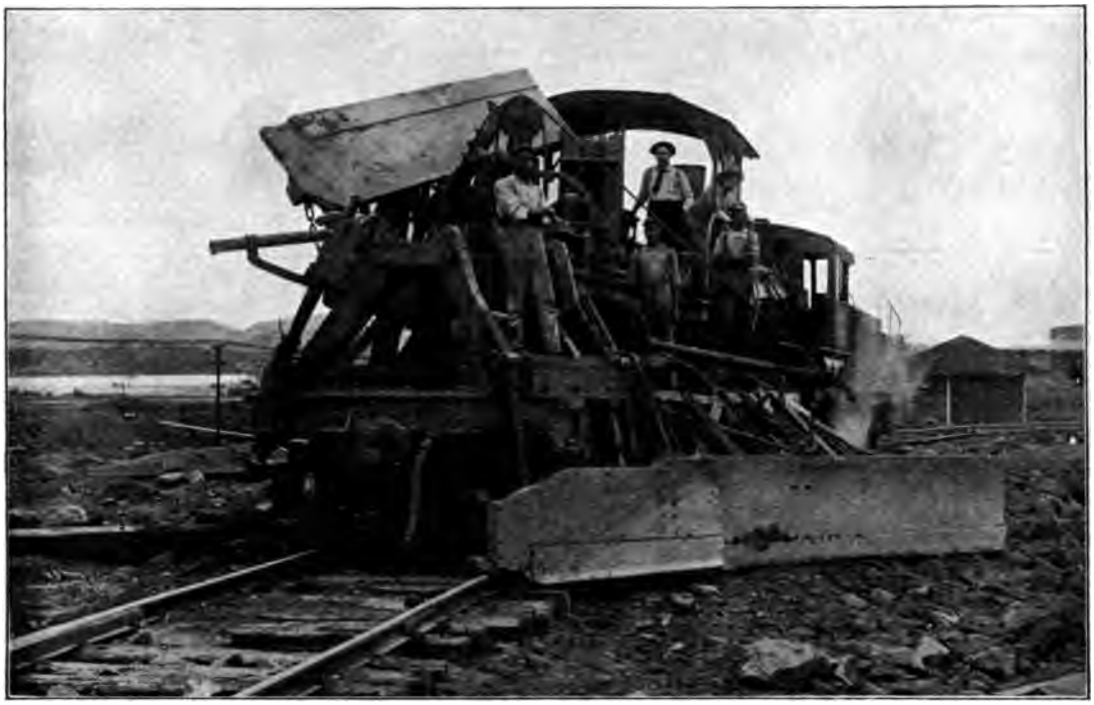
Rock channeler at work. These machines were used in Pedro Miguel Lock, where the natural foundation was hard trap rock. They cut grooves into this rock to the required depth for the installation of the floor culverts, after which the material was blasted loose, the aim being not to disturb the rock between the culvert trenches. They were also used in the Canal near Bas Obispo where the excavation was through solid rock.



Excavated material is transported in several kinds of cars, one of which is the Western Dump Car, shown in the picture. In some of the cars, the body is held upright by a chain grip, which, when released, allows the body to tip, emptying the contents. Others are dumped by air.



An unloading machine at work on a train of Lidgerwood flat cars. The unloader, actuated by steam from the locomotive, pulls the plow by a steel cable which coils around a drum. A man rides the plow, and signals the movements with a flag.



An earth spreader at work. After the cars have been unloaded, an earth spreader comes along and levels off the ground.

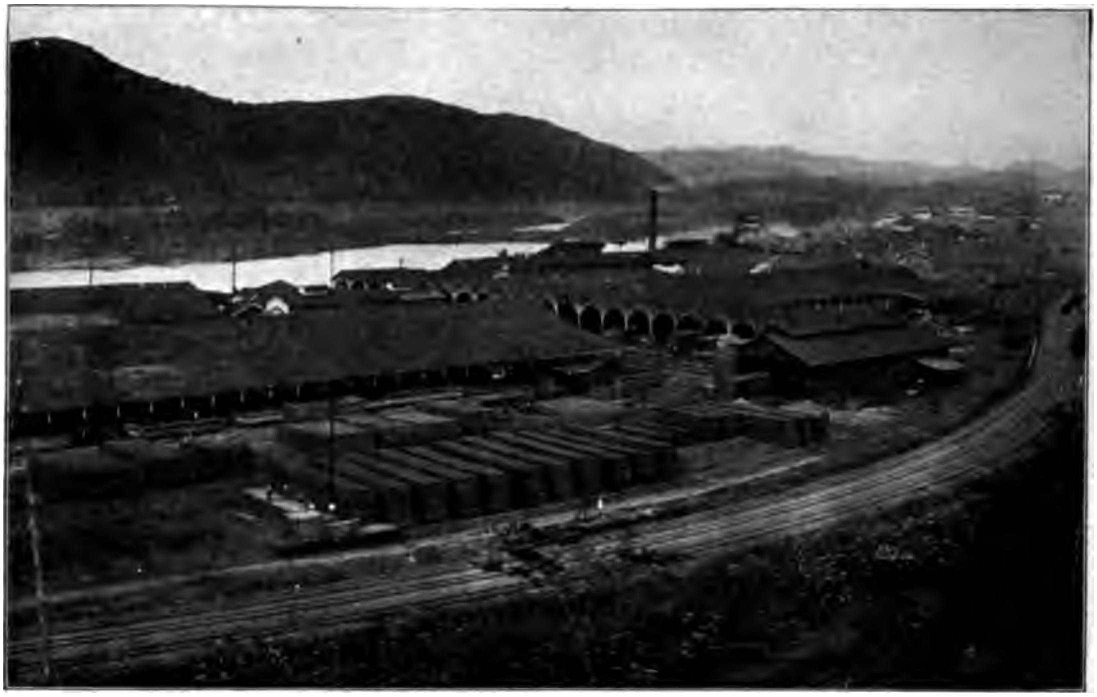
In order to dispose of the material from the Cut, large dumps had to be established. The site of this one, known as Miraflores dump, was formerly a swamp, but it has now been built up to a height of more than 40 feet. A large amount of the excavated material was used in building the Dam at Gatun and the Naos Island breakwater on the Pacific side. The spoil from Culebra Cut has been carried all the way from five to twenty-four miles.

A loaded train of Lidgerwood flat cars coming out of the Cut at Pedro Miguel. During the latter part of the excavation, the Cut was at such a depth below the surrounding levels that long inclines had to be built, up which the dirt trains were pulled by two and three locomotives.

Two wrecking cranes picking up a steam shovel. These machines range in capacity from 15 to 100 tons, and are kept under steam day and night, ready for any emergency in the transportation service.

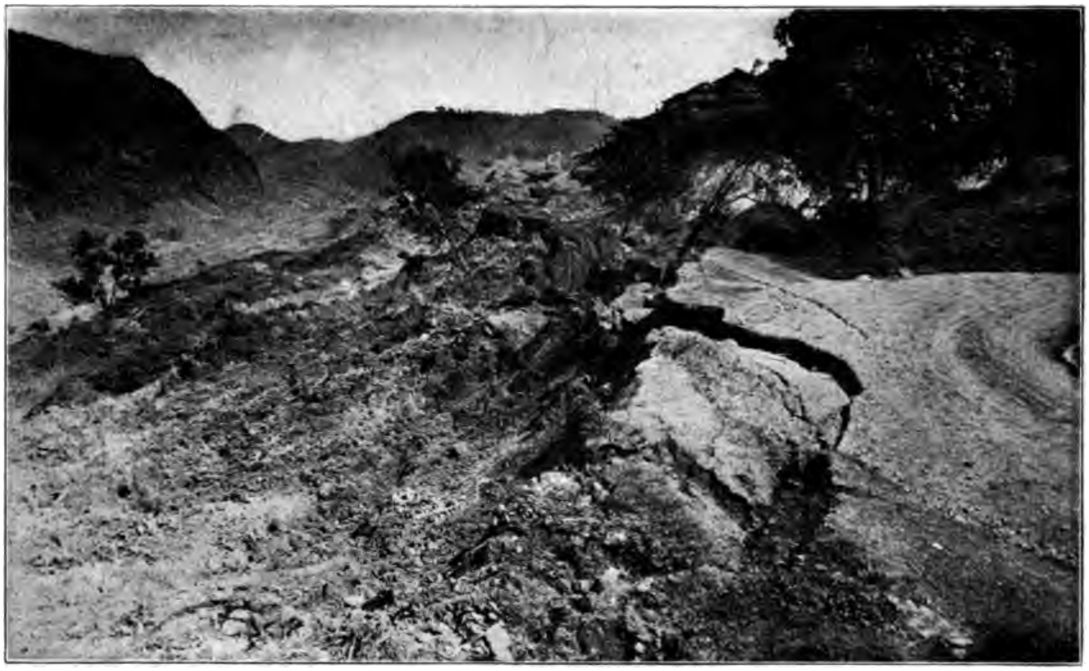
Power stations are situated at various points along the Canal to furnish power to the electrically-operated machinery, as well as to light the Canal Zone settlements. The building shown in the picture is the Miraflores station which supplied power to the construction machinery at Pedro Miguel and Miraflores Locks. It is an oil-burning plant but can be converted to a steam plant at any time. Many of the industrial plants and all passenger locomotives are equipped with oil burners.

The corral at Ancon. Corrals are located at all of the Zone settlements, and there are about 650 animals in the Canal service, including 377 mules. The majority of them were brought from the United States, and all hay and feed comes from the States.

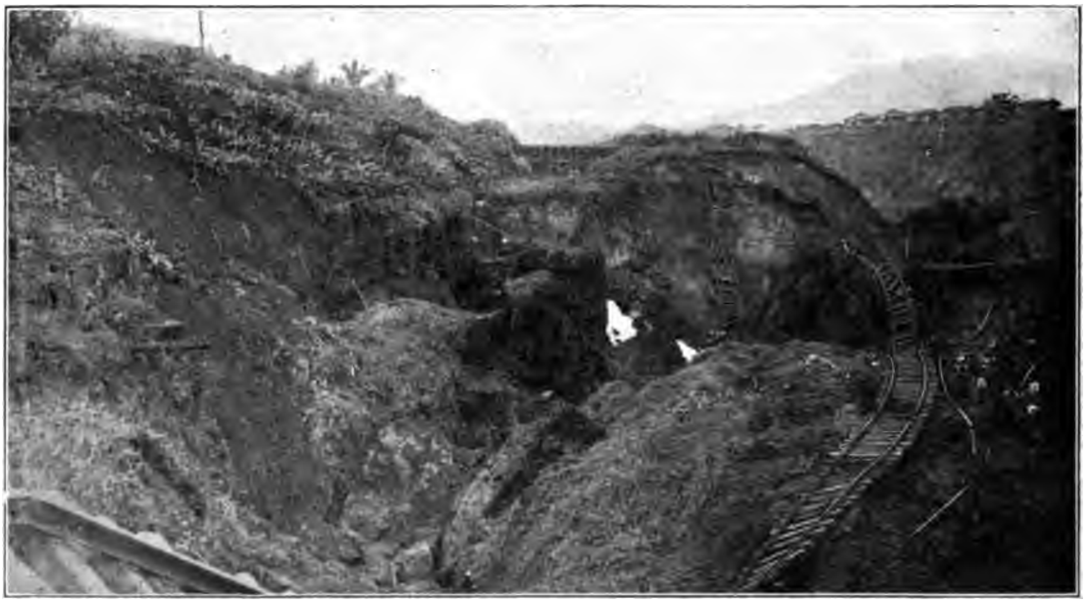


The immense amount of machinery used on the Canal work required exceptionally complete repair facilities. This is the Gorgona shops, the largest on the Canal, where repairs were made to every kind of equipment, except steam shovels, from clocks to locomotives. These shops have been dismantled and moved as the waters of the Gatun Lake will cover this site. The permanent repair shops will be located at Balboa.

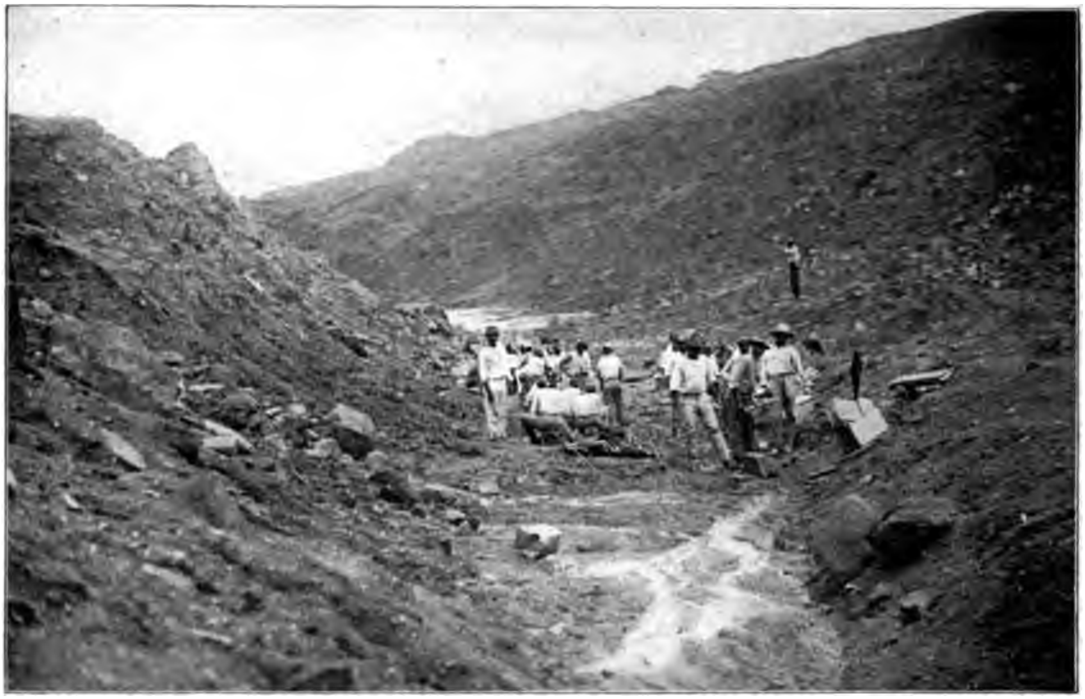
Repair shops at Empire, showing the native village in the background. All major repairs to steam shovels were made at these shops. Steam shovels were inspected daily and the minor repairs were done in the field.



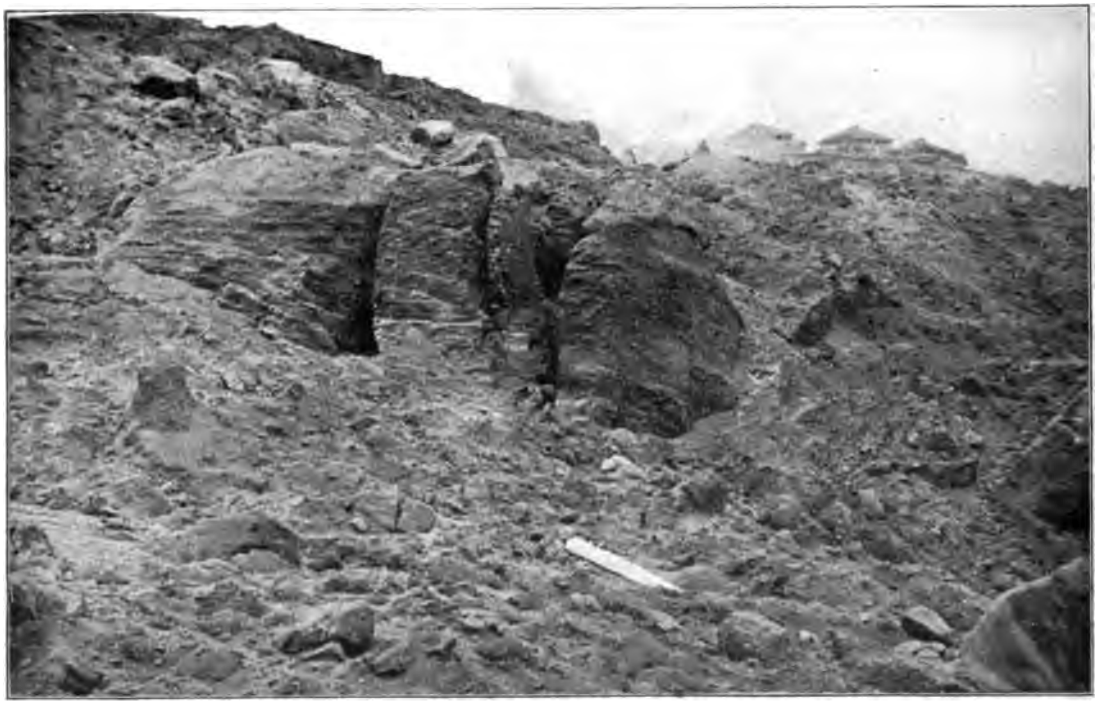
Many slides have developed during the latter part of the Canal work which have caused a great deal of damage and the excavation of much more material than was formerly estimated. This view shows a break on the west bank at Culebra which encroached on the village of Culebra to such an extent that it was necessary to move a large number of buildings, including the hotel and Y. M. C. A. Clubhouse.



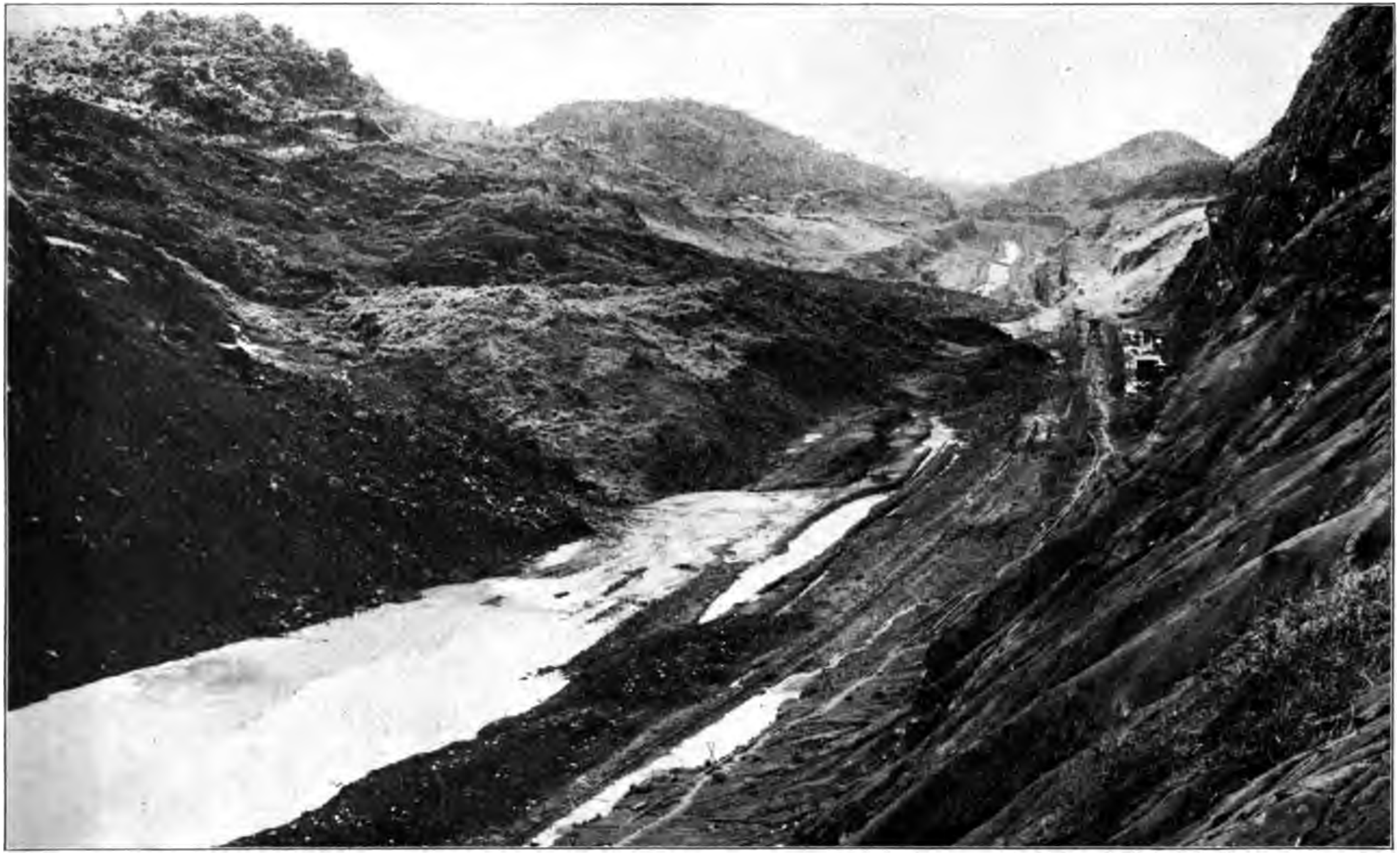
A break in the east bank of the Canal near Bas Obispo. This was caused by high water in the diversion channel, which broke through the separation wall, carrying into the Canal over 100,000 cubic yards of material, and flooding it for some distance. The disastrous effect on the railroad is clearly shown.



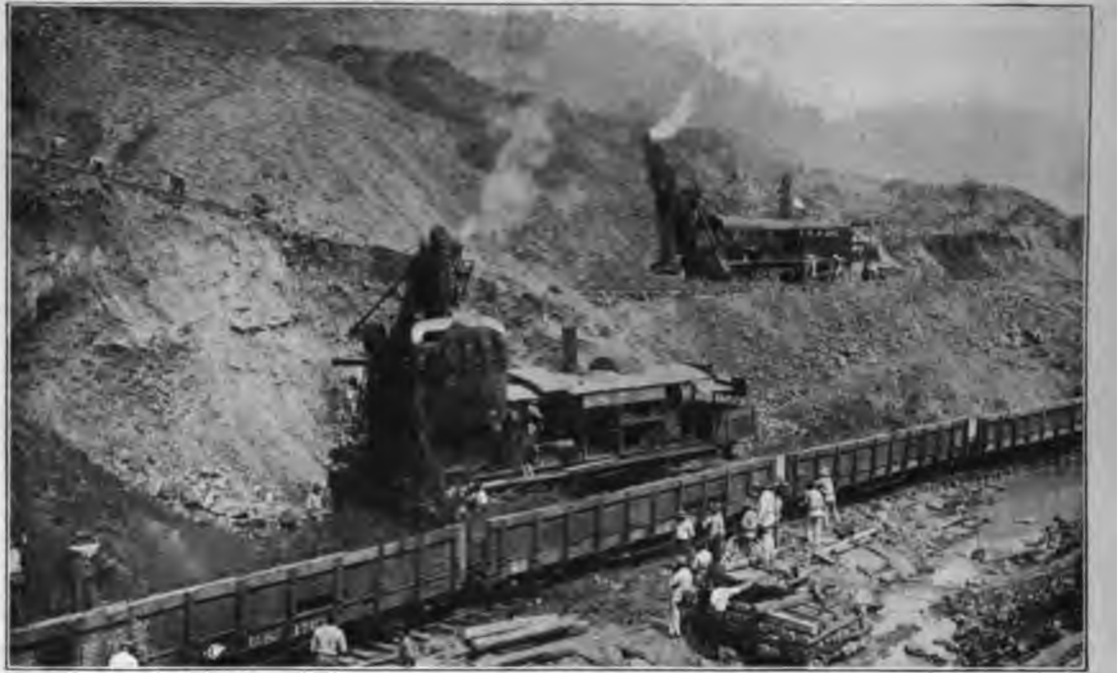
This shows where the slides on either bank have encroached upon the prism of the Canal to such an extent as to almost effect a closure.



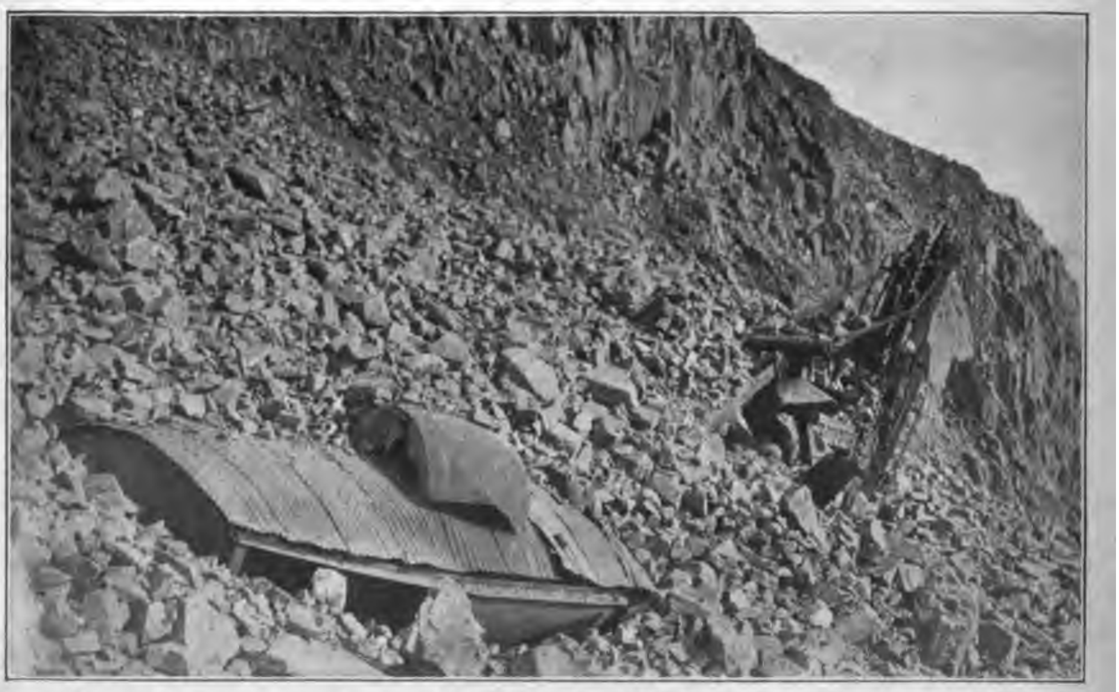
Telling effects of the slide in the west bank at Culebra. Most of this has now been cleared away, and the danger of similar trouble at this point has largely passed, because of the method adopted of terracing the upper levels to relieve the weight on the banks.



Cucaracha slide before the destruction of Gamboa dike. Some of these movements of material into the Cut are designated slides; others are called breaks. The one at Cucaracha typifies the normal or gravity slide.



Steam shovels working in the slide at Cucaracha. This slide showed evidence of activity as far back as 1887, when the French were at work on the Canal, and has been a source of trouble ever since.



This graphically portrays the result of a slide which has nearly buried a steam shovel. Colonel Gaillard, the Division Engineer, in charge of operations in Culebra Cut said: "I know of no single thing that has done so much to complicate the engineering problems of our work or to hinder and curtail the yardage output as the slides." Colonel George W. Goethals, Chairman and Chief Engineer, said: "The only way to overcome the slides is by unremitting excavation."

AUXILIARY PLANS and PROJECTS

THE Panama Canal Act, which was signed by ex-President Taft on August 24, 1912, provides for the opening, maintenance, protection, and operation of the Canal, and the sanitation and government of the Canal Zone. Authority is invested in the President to carry out its provisions at such time as conditions warrant. While the law provides for the future of the Canal insofar as its needs are now apparent, it is probable that situations will eventually arise requiring its modification in some respects, but the main object, that of transferring the great enterprise from the construction to the operating stage will be attained.

ACQUISITION OF PRIVATE LANDS

Ex-President Taft, by Executive Order dated December 5, 1912, declared that all land and land under water within the limits of the Canal Zone were necessary for the construction, maintenance, operation, protection, and sanitation of the Panama Canal, and authorized Colonel Goethals to take possession of such land on behalf of the United States. In the hearings before the Senate Committee on Interoceanic Canals, prior to the passage, by the Senate, of the Act of August 24, 1912, Colonel Goethals went on record in favor of the depopulation of the Canal Zone, and the acquisition of all private lands therein, as follows:

Senator Bristow: "What would you do with the people you have got there (meaning Canal Zone), now?" Colonel Goethals: "I would drive them all out of there."

Senator Bristow: "Drive them off?" Colonel Goethals: "Yes, sir; the bulk of the people that are there now are incident to the Canal, and as the Canal work is completed I would return them to their native islands, or to Europe, wherever they came from originally."

Senator Bristow: "Now, would you let this 10-mile strip grow up into jungle?" Colonel Goethals: "Yes, sir, it is the greatest safeguard the Canal can have."

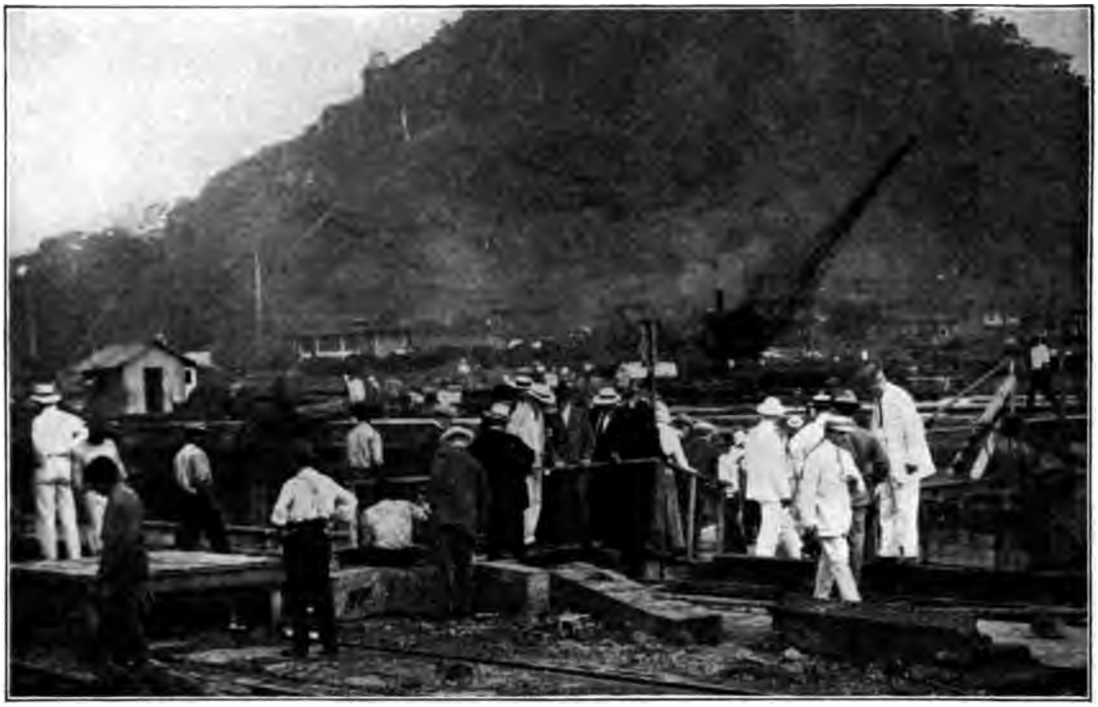
Senator Bristow: "You think that it would not be practicable for an enemy to secrete himself in the jungle and approach the vital parts of the Canal through the jungle more easily than through an inhabited country." Colonel Goethals: "I am assuming that the Canal is properly defended by the American troops, and that the necessary safeguards have been provided to prevent any such attack; under those conditions it would be impossible."

Senator Bristow: "Well, if that is impossible, then why should the inhabitants on the Zone be a menace?" Colonel Goethals: "In that they can give information. They will clear the land and leave open spaces and enable larger forces to concentrate against us than is possible with the jungle."

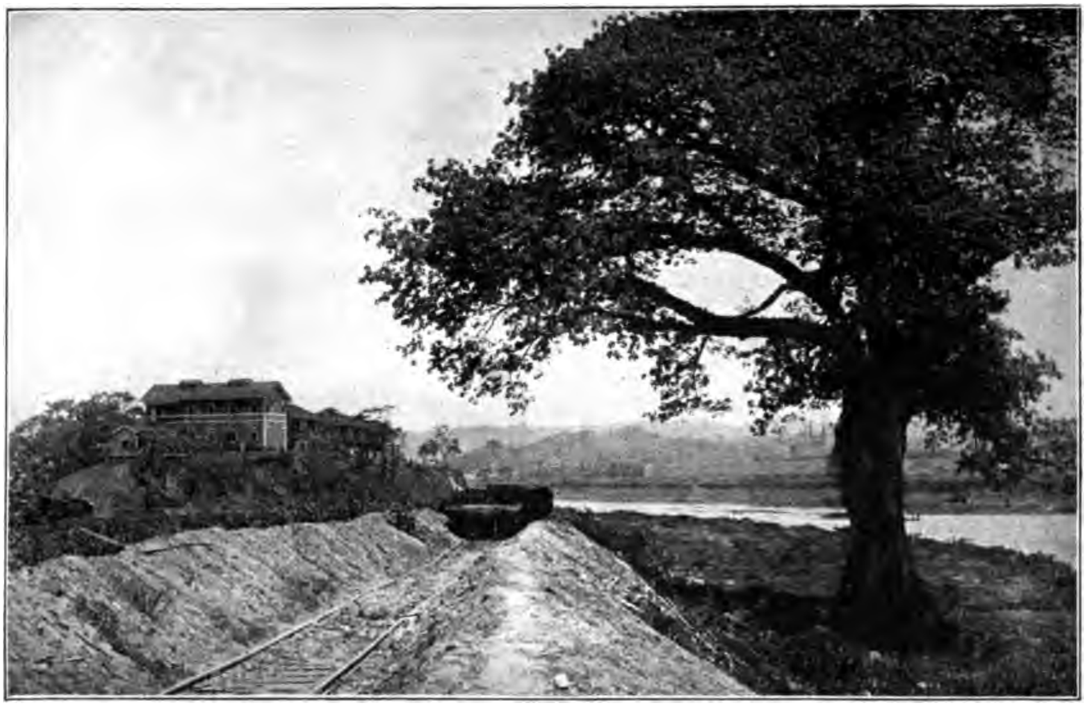
Article 6 of the Canal Treaty of February 26, 1904, provides that all damages caused to the owners of private lands or property of any kind shall be appraised and settled by a joint commission appointed by the Governments of the United States and Panama, whose decisions as to such damages shall be final, and whose awards shall be paid solely by the United States. Under this provision there have been four different commissions, but the most important is the last to which was delegated the delicate task of adjudicating the remainder of the private lands in the Canal Zone in accordance with the Executive Order of December 5, 1912.

Joint Land Commission as organized on March 1, 1913. Left to right—Hon. Samuel Lewis, Dr. Roland P. Falkner, Mr. J. C. Luitwieler, Secretary (standing), Dr. Federico Boyd, Dr. Leo S. Rowe.

The American members of this commission, Dr. Roland P. Falkner of Washington, D. C., and Dr. L. S. Rowe of the University of Pennsylvania, were appointed by ex-President Taft on January 24, 1913. The Panamanian members, appointed by President Porras of Panama, were Mr. Samuel Lewis, and Dr. Federico Boyd, both prominent in local affairs. The commission met on March 1, 1913, adopted rules of procedure, and began its hearings, which will probably not be concluded until some time in 1914.

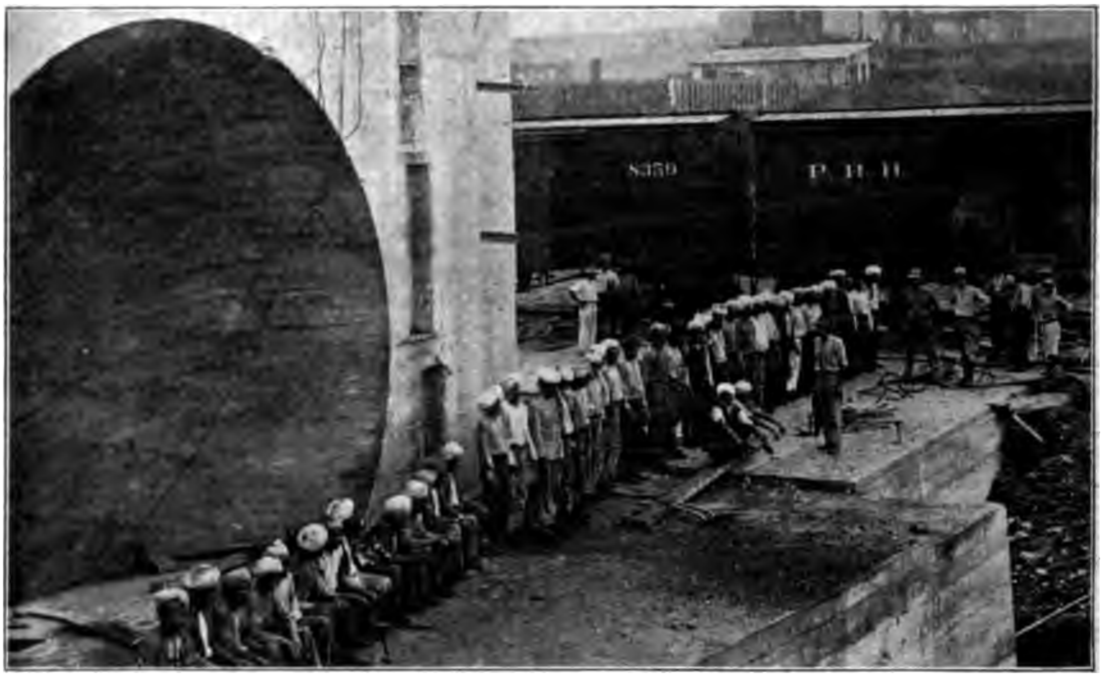


Visitors inspecting the work on the locks at Pedro Miguel. Thousands of tourists have visited the Canal during the last few years, including people in every walk of life from the States, as well as committees from almost every nation on the globe.



"Big Tree," a well-known landmark formerly on the banks of the Chagres River at Gorgona. Was dynamited in August, 1913, so as not to become an obstruction to navigation.

At the outset, the commission was confronted with the precedent established by former commissions, which did not recognize the rights of occupiers on lands, but dealt only with the owners. This position was abandoned by the present commission, which has made awards to the occupiers as well as to the owners. The awards appear to be uniformly satisfactory to claimants, although there has been some complaint of the delay in making settlement. Opinions have been handed down from time to time, and in the main have been favorable to the claimants. The rise of Gatun Lake made it necessary to take up the claims of private residents in that section first. This part of the work was practically completed in August, 1913, although payments of some of the awards have been held up, due to protests from the Counsel of the United States, who claimed that in these particular cases the commission acted without jurisdiction. The point at issue has been referred to the Attorney General of the United States for decision.

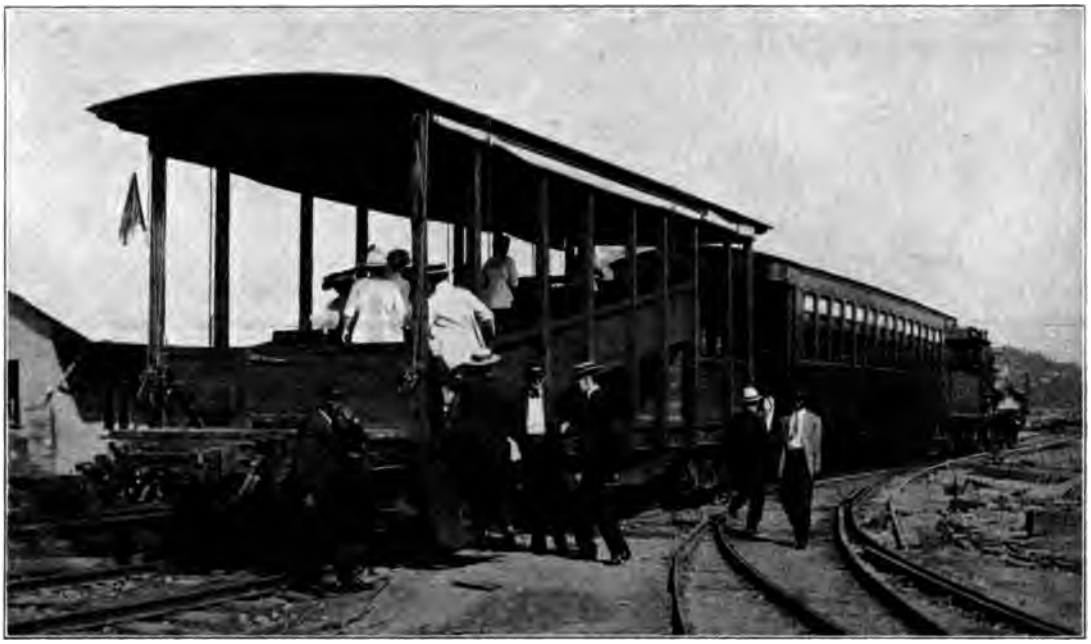


A group of East Indian laborers in the Canal service. Those sitting, are directly in front of an elbow in one of the great lock wall culverts.

It is impossible to arrive at a close estimate of the total amount to be awarded in damages, but it may be as much as several million dollars in case all private land is purchased. The work of the commission also covers the adjudication of land inundated by Gatun Lake outside the boundaries of the Canal Zone within the 100-foot contour line. Dr. Rowe resigned in September, 1913, to resume his work at the University of Pennsylvania.

TOLLS

In accordance with the power conferred upon him by the Canal Act of August 24, 1912, President Taft, on November 14, 1912, anticipating the



A sightseeing, or "rubber neck" train, which is taken over the Canal work three times each week. Every facility has been given tourists to view the operations. About 75,000 people have visited the Canal since January 1, 1910.

Isthmian Elks taking a trip through the Canal April 20, 1913. Note the striking background.

early opening of the Canal, proclaimed the following rates of tolls to be paid by vessels using it:

1. On merchant vessels carrying passengers or cargo, $1.20 per net vessel ton—each 100 cubic feet—of actual earning capacity.

2. On vessels in ballast, without passengers or cargo, 40 per cent. less than the rate of tolls for vessels with passengers or cargo.

3. Upon naval vessels, other than transports, colliers, hospital ships and supply ships, 50 cents per displacement ton.

4. Upon Army and Navy transports, colliers, hospital ships and supply ships, $1.20 per net ton, the vessels to be measured by the same rules as are employed in determining the net tonnage of merchant vessels.

The provision exempting American vessels in the coastwise trade from the payment of tolls brought forth a protest from the British Government on the ground that it was a violation of the Hay-Pauncefote Treaty, which provides "That the Canal shall be free and open to the vessels of commerce and of war of all nations on terms of entire equality, so that there shall be no discrimination against any nation in respect to the condition or charges of traffic." To many, the granting of free tolls to American ships in the coastwise trade would not seem to be discriminating against ships of foreign nations, which are not allowed by law to engage in that trade. Great Britian, however, points out that cargo intended for United States ports beyond the Canal, either from east or west, shipped on a foreign vessel, could be sent to its destination more cheaply, through the operation of this exemption, by landing it at a United States port before reaching the Canal, and then sending it on as coastwise traffic. Then, too, goods might be shipped from a port in the United States, either from east

Showing group of Hindoos in khaki, puttees, and turbans, waiting to greet the visiting Shriners from the United States.

or west, through the Canal, and then re-shipped to a foreign port. The British view, therefore, is that if it were possible to regulate the coastwise traffic so that cases similar to the above might be avoided; in other words, that only *bona fide* coastwise trade be benefited by the exemption, the objection would be removed.

Procession of Nobles of Mystic Shrine after disembarking at Colon. A delegation of about 150 Shriners from the United States visited the Isthmus and on Sept. 1, 1913, initiated a class of 170 candidates in the locks at Miraflores.

In the letter of the Treaty discrimination appears impossible. One plan suggested by those who wish to make the Canal an instrument for the upbuilding of the American merchant marine is to charge all vessels alike, and then reimburse American vessels by the amount of tolls they may have paid. This would be a form of ship subsidy, but only in favor of the ships making use of the Canal. The British Government does not question the right of the United States to grant a subsidy to its shipping, but does believe that granting a subsidy to ships for using the Canal would be discrimination in respect to the conditions of the charges of traffic.

The Canal tolls are based on the probable cost of operation and maintenance of the Canal. If American ships are granted free tolls, the cost of Canal maintenance will be thrown upon foreign shipping. However, under the present Act, and under the President's proclamation, it is contended that no discrimination has been shown against foreign shipping. The probable tonnage using the Canal was figured when the tolls were fixed, and this tonnage included coast to coast shipping, and American shipping carrying foreign commerce of the United States.

Great Britain also objects to the fact that under the Convention of Panama of 1903, vessels belonging to the Panama Government are exempted from the

The Author at Slifer Park, Colon.

payment of tolls, and to the further fact that tolls in the case of ships belonging to the United States and its citizens may be fixed at a lower rate than in the case of foreign ships. The exemption of ships belonging to Panama agreed upon in the Hay-Buneau-Varilla Convention was also a part of the proposed Hay-Herran Treaty of 1903. Some argue that Great Britain should have no more objection to such an exemption now than 10 years ago, when it had none.

The tolls for ships using the Canal have been fixed, and it remains to be seen whether or not foreign shipping will have to bear more than their proportion of the cost of maintenance and operation.

PROTECTING THE CANAL

One of the principal objections to Canal fortifications when Congress first took action was that the United States might be violating its treaties with Great Britain. The Clayton-Bulwer Treaty of 1850 gave the United States the right to construct the Canal, but provided that the completed waterway should be

Cristobal Point looking out over the Atlantic entrance to the Canal. The building to the left is one of the old DeLesseps houses, now used for offices by the Canal Commission.

unfortified and forever remain neutral, free and open to vessels of commerce and of war of all nations on terms of equality. This treaty was abrogated in 1901 by the Hay-Pauncefote Treaty, now in force. This treaty also provides for the neutralization of the Canal, but no word is said as to fortifying it. The objection, if there was any, is no longer sustainable, inasmuch as Great Britain, the only nation that had any right to object, has acquiesced in the erection of forts. The other great powers have constantly recognized the right and necessity of the United States to fortify.

Under the existing treaty it is necessary that the Canal be kept neutral and open on terms of equality to vessels of all nations. It has been contended that this could be accomplished much more effectively by means of an international treaty between the nations interested who would guarantee its safety in time of war as in time of peace. Such a treaty, backed by England's enormous naval power and her control of the Mediterranean and Red Seas, is the protection of the Suez Canal. A similar treaty might avail for the United States under conditions of universal peace, but universal peace has not yet been attained. Nations continue to go to war in spite of treaties, and, in the heat of conflict, frequently ignore all laws both of usage and humanity. Treaties are effective when there is power to enforce them. To maintain neutrality then, it is argued that the United States must have the power to do so, and in no better place can that power be exercised than in forts on the Canal.

One of the greatest benefits the United States expects to get from the Canal is increased naval effectiveness. The Canal would naturally be the first place an enemy would endeavor to control, treaty or no treaty; and the other powers to a treaty, if there were any, would either stand aloof, or take sides in the international struggle which might result. The Canal is being built by Americans with American money and skill. If it is to remain to America, it must be protected; strength to resist is the best form of protection.

To maintain neutrality is the first object of the fortifications; the second is to retain to the United States what has been accomplished by its citizens. Keeping the Canal neutral does not mean that the United States will be com-

Wall scaling contest between men of the U. S. Marine Corps and the Tenth Infantry, U. S. A. A Fourth of July event.

pelled to keep it open to a foe in pursuit of her own ships, or allow hostile ships to pass through on their way to blockade or bombard an American city.

These questions have been settled to the extent that Congress has appropriated, up to June 23, 1913, a total of $10,676,950 for the protection of the Canal. A report of the Fortification Board of January 4, 1911, estimates the amount to be appropriated at $12,475,328. The amount expended on fortifications up to June 30, 1913, was $3,114,357.52. The work of preparing placements for 14-inch and 6-inch guns, and pits for 12-inch mortars, to protect the Canal entrances is well under way. There will also be one 16-inch gun, the largest made, placed to protect the Pacific entrance to the Canal. On the Pacific side the islands of Naos, Culebra, Perico, and Flamenco are being fortified and form one reservation, while, on the mainland at Balboa, a second reservation will be established. On the Atlantic side there will be a fort on Margarita Point, about a mile north of Manzanillo Island, on which Colon is situated; another on Toro Point across the bay from Colon, and one on the mainland at Colon. In the neighborhood of the locks, those at Gatun, seven miles inland, and those at Miraflores and Pedro Miguel, inland nine and eleven miles, respectively, there will be located field defenses to provide against attack by landing forces. This work is being done under the direction of Lieut. George R. Goethals, the elder son of Col. George W. Goethals, the builder of the Canal. It is planned to keep on the Isthmus 12 companies of coast artillery, one battery of field artillery, four regiments of infantry, one squadron of cavalry, and one batallion of marines.

A military force has been maintained in the Canal Zone ever since American occupancy. This is Camp Elliott, which occupies a commanding site near Bas Obispo, the headquarters for the local detachment of the United States Marine Corps.

The forts, and batteries comprising them, have been named, as follows:

At the Pacific terminus—Fort Grant and Fort Amador, the first located on the group of islands in the bay, in honor of Gen. Ulysses S. Grant, U. S. A., who died on July 23, 1885, and the second, located on the mainland at Balboa, in honor of Dr. Manuel Amador Guerrero, first president of the Republic of Panama, who died on May 2, 1909.

At the Atlantic terminus—Fort Sherman, Fort Randolph, and Fort De Lesseps, the first, in honor of Gen. William T. Sherman, U. S. A., who died on February 14, 1881, the second, in honor of Maj. Gen. Geo. Wallace F. Randolph, U. S. A., who died September 9, 1910, and the third, in honor of Count Ferdinand de Lesseps, promoter of the Panama Canal, who died December 7, 1894.

A street in the marine camp showing the barracks. Much work has been done by the men in beautifying the grounds, and this picture shows the result of their efforts.

Fort Sherman will be located on Toro Point, Fort Randolph on Margarita Point, and Fort De Lesseps on the mainland at Colon.

FORT GRANT MILITARY RESERVATION

Battery Newton, in honor of Maj. Gen. John Newton, U. S. Volunteers (Brigadier General, Chief of Engineers, U. S. A.), who died May 1, 1895.

Battery Merritt, in honor of Maj. Gen. Wesley Merritt, U. S. A., who died December 3, 1910.

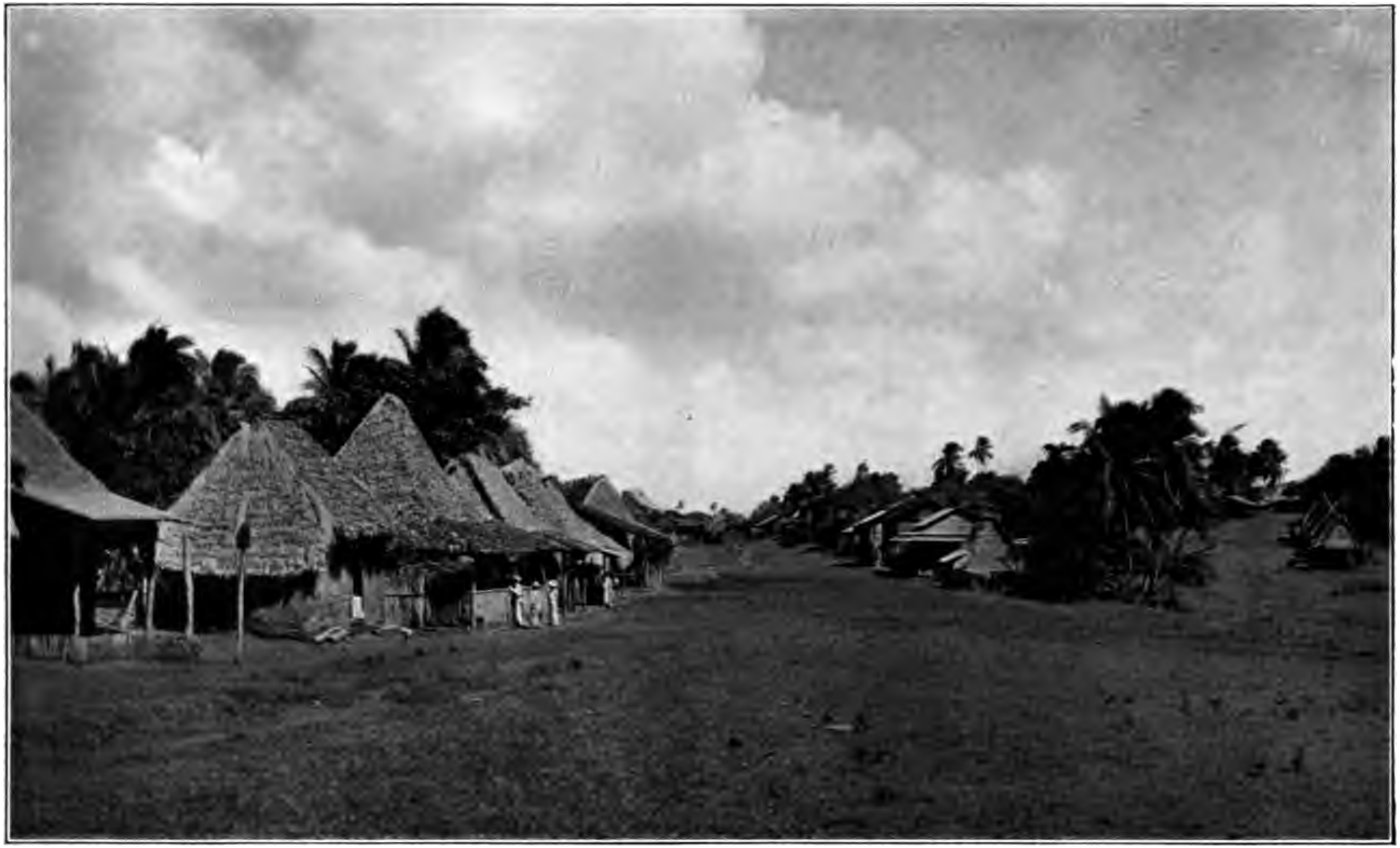
Battery Carr, in honor of Brevt. Maj. Gen. Jos. Bradford Carr, (Brig. Gen. U. S. Vols.), who died Feb. 24, 1895.

Battery Prince, in honor of Brig. Gen. Harry Prince, U. S. Vols. (Lieut. Col. U. S. A.), who died August 19, 1892.

Battery Warren, in honor of Maj. Gen. Gouverneur K. Warren, U. S. Vols. (Lieutenant Colonel, Corps of Engineers, U. S. A.), who died August 8, 1882.

In 1911 the War Department decided to send a regiment of infantry to the Isthmus. This is their camp, known as Camp Otis, near Las Cascadas.

Camp life at Camp Otis.



A typical street scene in the native village at Chorera, Panama. On account of the mild climate, which prevails the entire year, the only protection needed is from the sun and torrential rains. The thatched roofs give ample protection to the natives who inhabit them.

Battery Buell, in honor of Maj. Gen. Don Carlos Buell, U. S. Vols. (Colonel Assistant Adjutant General, U. S. A.), who died November 19, 1898.

Battery Burnside, in honor of Maj. Gen. Ambrose E. Burnside, U. S. Vols. (First Lieutenant, Third U. S. Artillery), who died September 13, 1881.

Battery Parke, in honor of Maj. Gen. John G. Parke, U. S. Vols. (Colonel, Corps of Engineers, U. S. A.), who died December 16, 1900.

FORT AMADOR MILITARY RESERVATION

Battery Smith, in honor of Maj. Gen. Charles F. Smith, U. S. Vols. (Colonel, Third U. S. Infantry), who died April 25, 1862.

FORT SHERMAN MILITARY RESERVATION

Battery Howard, in honor of Maj. Gen. Oliver O. Howard, U. S. A., who died October 26, 1909.

Naos Island, one of the islands in Panama Bay belonging to the United States, which is being fortified. The island is connected to the mainland by a breakwater.

Battery Baird, in honor of Brig. Gen. Absalom Baird, who died June 14, 1905.

Battery Stanley, in honor of Maj. Gen. David S. Stanley, U. S. Vols. (Brigadier General, U. S. A.), who died March 13, 1902.

Battery Mower, in honor of Maj. Gen. Joseph A. Mower, U. S. Vols. (Colonel, Twenty-fifth Infantry), who died January 6, 1870.

Battery Kilpatrick, in honor of Maj. Gen. Judson Kilpatrick, U. S. Vols. (Captain, First Artillery), who died December 2, 1881.

FORT RANDOLPH MILITARY RESERVATION

Battery Tidball, in honor of Brig. Gen. John C. Tidball, U. S. A., who died May 15, 1906.

Battery Zalinski, in honor of Maj. Gen. Edward Lewis Zalinski, (5th U. S. Artillery), who died March 10, 1909.

Battery Webb, in honor of Brevet Maj. Gen. Alexander S. Webb, U. S. A. (Lieutenant Colonel, 44th U. S. Infantry), who died February 12, 1911.

Battery Weed, in honor of Brig. Gen. Stephen H. Weed, U. S. Volunteers (Captain, 5th U. S. Artillery), who was killed in action, July 2, 1863, at Gettysburg, Pa.

FORT DE LESSEPS MILITARY RESERVATION

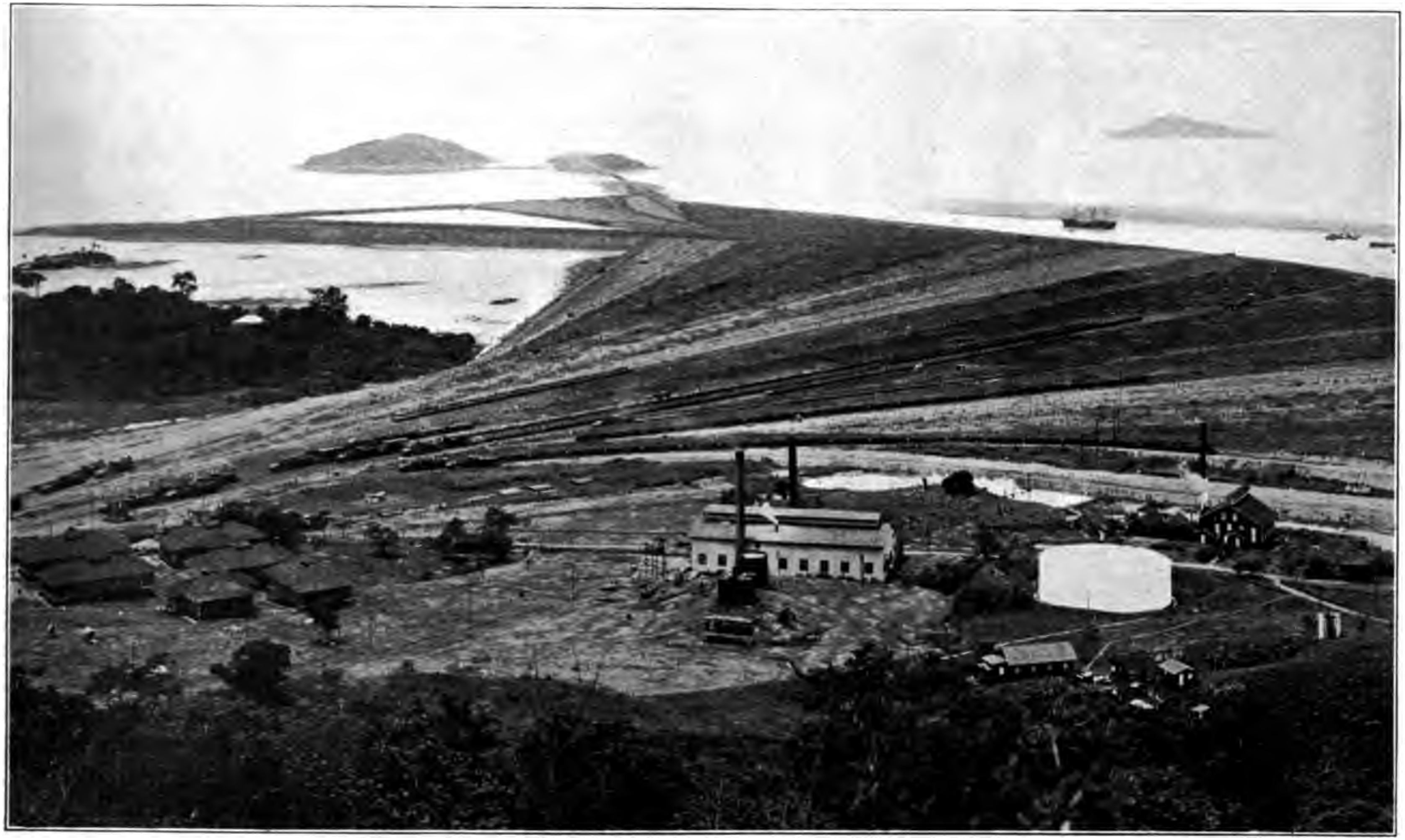
Battery Morgan, in honor of Brig. Gen. Charles H. Morgan, U. S. Volunteers (Major, 4th Artillery), who died December 20, 1875.

BREAKWATERS

To protect Colon harbor from the violent northers which occasionally occur during the winter months, and which often made it unsafe for vessels to lie at anchor while they were in progress, and also to reduce to a minimum the amount of silt that may be washed into the Canal channel, a breakwater extending in a northeasterly direction from Toro Point has been built out into the bay. Including its shore connections it is 11,700 feet, or a little over two miles long. It is a trestle fill, and contains about 2,840,000 cubic yards of rock. An embankment was first built up to within 15 feet of the surface of the water and the piles for the trestle were driven through this fill. From the trestle, which was double tracked for nearly its entire length, rock quarried at Toro Point and excavated from the Canal prism was dumped to form a core. This core was then armored with hard rock brought from the quarries at Porto Bello. The breakwater is 15 feet wide on the top, and is about 10 feet above mean sea level. It is proposed to build an east breakwater, about 7,000 feet long, on the opposite side of Limon Bay extending out from Coco Solo Point.

Toro Point, at the Atlantic entrance to the Canal, which is being fortified.

On the Pacific side, a breakwater extends from Balboa to Naos Island, nearly parallel to the Canal channel, for a distance of about 17,000 feet, or a little more than three miles. Like the Toro Point breakwater, it is a trestle fill. It is practically a continuation of the Balboa dumps, and contains about 18,000,000 cubic yards of earth and rock taken from Culebra Cut. It varies from 20 to 40



Naos Island breakwater, showing fill extending out from the mainland. A total of 474 acres had been reclaimed from the ocean at this point up to June, 1913. Practically all the material for the fill came from Culebra Cut. It is designed to cut off a cross current, which has carried a large amount of mud and silt into the Canal channel. In addition, it will serve as a causeway connecting the islands, and the fortifications thereon with the mainland.

feet in height above mean sea level, and is from 50 to 3,000 feet wide at the top. A breakwater is not necessary at this point as a protection against storms to the harbor at Balboa, but it serves to divert a swift cross-current that would carry soft material from the shallow harbor of Panama into the Canal channel. It also forms a rail connection between the mainland and the islands where work on the fortifications required the transfer of much construction material. Under the concession from Colombia under which the Panama Railroad operated, and which was transferred to the Republic of Panama, it was stipulated that the group of islands, of which Naos is one, should be connected by rail with the mainland, and the completion of the breakwater has served to fulfill this condition.

Toro Point breakwater. In order to protect the Cristobal docks and the Atlantic entrance to the Canal from heavy seas, a breakwater has been built out from Toro Point, on the opposite side of Limon Bay. It is over two miles long, and is armored with large rock brought from Porto Bello.

LIGHTING THE CANAL

Due to the complete system of aids to navigation, which is being installed throughout its entire length, ships will be able to pass through the Canal as well by night as by day. In the whole Canal there are 22 angles, eight of which are in Culebra Cut, and in order that ships can make the proper turns at these tangents, range lights, beacons, and lighted buoys are being placed. The range light towers are located on the longer tangents, and consist of two lights placed one behind the other, in order to prolong the sailing line until the proper moment for making the turn. They are situated on land, and it is necessary to keep *trochas* cleared of jungle growth, which, if left alone, would soon obscure the lights.

The towers are of reinforced concrete and of several different designs; the more elaborate structures will be used on the Gatun locks, and in the Atlantic and Pacific sections, where they are closer to the sailing lines of the vessels. In Culebra Cut, where range lights cannot be used to advantage on account of the height of the banks, beacons have been placed, three at each angle; between

One of the lighting towers under construction. These towers will be equipped with powerful lights.

Lighthouse at Toro Point which is maintained by the Panamanian Government.

An avenue of lamp posts on Gatun Locks.
Lighting tower in the distance.

Close view of lighthouse on Gatun Locks.
The Locks will be brilliantly lighted at night.

The signal tower at Colon, by moonlight.

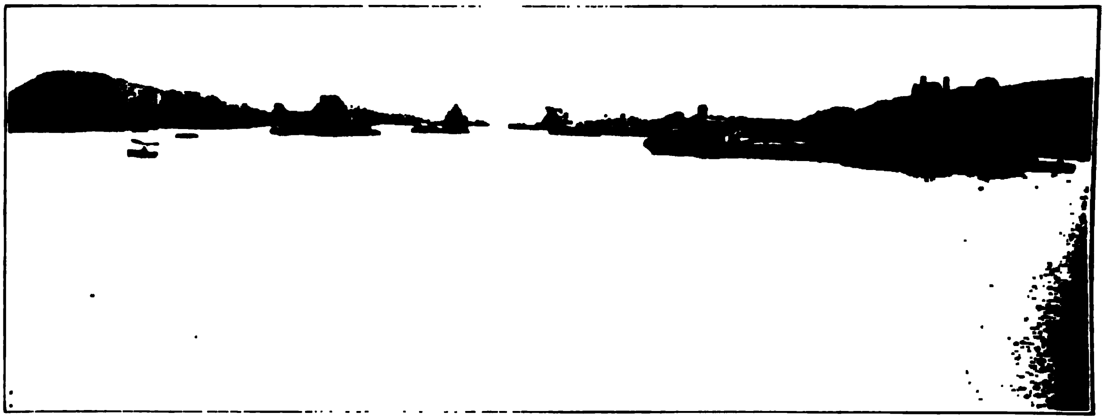
these there are intermediate beacons in pairs, one on each side of the Canal. The beacons are also built of concrete. Throughout the Canal entrances, and Gatun and Miraflores Lakes, lighted buoys are placed about one mile apart to mark each side of the channel. At the Atlantic entrance there is a light and fog signal station at the end of the west breakwater, and there will be another lighthouse on the east breakwater when that is completed.

Acetylene gas and electricity are used in all lights, the latter where the lights are conveniently accessible. The candlepower of the range lights will vary, according to the length of the range, from about 12,000 to 300,000 candlepower. The most powerful lights will be those marking the Atlantic and Pacific entrances, visible from 12 to 18 statute miles. Mr. W. F. Beyer, assistant engineer in the office of the Assistant Chief Engineer, is in charge of the work of the Lighthouse Subdivision.

The site of the proposed harbor and terminal works at Balboa. Here, immense shops, and a dry dock capable of accommodating any ship that can use the Canal locks will be built. The work on shops and harbor has been begun.

PORT FACILITIES

The amount of traffic that will require terminal facilities after the opening of the Canal is problematical. The Canal Commission, however, has based its plans on a liberal estimate, and work is in progress on new docks at Cristobal and Balboa. The facilities at Cristobal consist of three new piers, Nos. 15, 16 and 17, with a total water frontage of 3,890 feet, in addition to 378 feet frontage at the head of the slip for small boats, and are of sufficient size to provide berthage for five vessels of 10,000 tons each at one time. Dock 15, 426 feet long, is the smallest of the [illegible] tually an extension of Dock 11, built several years ago. T [illegible] s the water front at Cristobal, and is now used when the old wharves at Colon are crowded. Dock 17, 1,042 feet long, is the only one to have water frontage on both sides. Room has been left for two additional piers, but their construction will be deferred until the necessity therefor develops. All the docks are protected by a mole or breakwater extending out from shore on the seaward side, marking the boundary line between Canal Zone and Panamanian waters. In Colon, the Panama railroad owns several old wharves, while the Royal Mail Steam Packet Company has its own wharf which it plans to enlarge. In addition, there are Docks 13 and 14 on the French Canal, midway between Cristobal and Mount Hope, now used principally in unloading Canal supplies, and which will probably be continued in service.



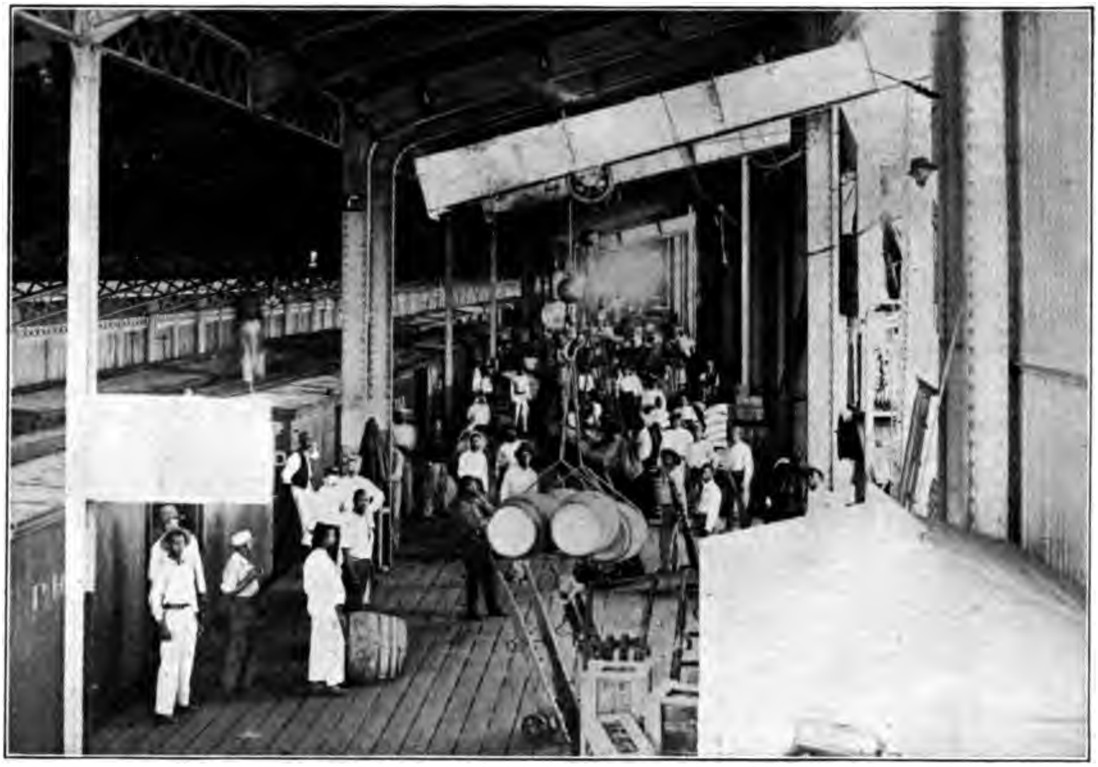
Dredges excavating in the Pacific Channel from Miraflores to the sea.

At Balboa, the piers for commercial use will be placed at right angles to the axis of the Canal, with their ends about 2,650 feet from the center of the 500-foot channel. They will be about 1,000 feet long and 200 feet wide, with 300-foot

Excavation in the immediate foreground is for the new Balboa dry dock. Buildings under construction are the permanent shops. Beyond where the dredge is working will be the Balboa ship basin.

slips between. The construction of one pier only will be undertaken at first, but room has been provided for four more. The old French steel wharf, 1,000 feet in length, and from 2,000 to 3,000 feet of berthing space in front of the permanent shops will be available when required.

The superstructure of the piers at Cristobal and Balboa will consist of one-story steel sheds, having a clear height of 25 feet. They will cover the entire space, with the exception of about 18 feet along each side and the outer ends. The wharves adjacent to the repair shops at Balboa will not be provided with any sheds. The total enclosed floor space at the new Cristobal docks is about 218,700 square feet. The track arrangement consists of a track along each edge of the piers, and two depressed tracks through the center of the sheds, bringing the car floors level with the floors of the sheds.



Handling cargo at Balboa. Balboa is a busy place and promises to be busier, as the permanent administration headquarters, dry docks, repair shops, coaling station, etc., will be located here.

In view of the uncertainty as to the amount of freight that may be handled, it was decided to forego the installation of expensive cargo-handling machinery at the docks. At Cristobal, with a range of tide of scarcely a foot, freight requiring transfer can be handled by ships' booms, supplemented by blocks attached to elevated girders along the sides of the pier sheds. At Balboa, where the average range of tides is close to 13 feet, electric cranes will be used, in addition to a floating crane for heavy cargo.

DRY DOCKS

The main dry dock will be at Balboa, in accordance with the wish of the Navy Department. It will be able to accommodate any vessel that is able to

[illegible]

[illegible] SHOPS

The permanent [illegible] at Balboa, situated in the area between [illegible] repair berth, and are designed to maintain the following

Heavy repairs to the Canal marine equipment have been handled in this dry dock on the Atlantic side, and by shipways on the Pacific side at Balboa. A large dry dock is being built which will accommodate any vessel that may use the Canal.

equipment: Locks, spillway, and power plant machinery; water and land equipment retained for the maintenance and operation of the Canal; rolling stock and equipment of the Panama railroad; mechanical apparatus connected with the coaling plants; fortifications; cold storage plant; wireless stations, etc.; making of repairs required by individuals and companies on the Isthmus; making of repairs required by commercial vessels, and making of such repairs as may be required by vessels of the United States Navy and vessels belonging to other governments. Work on the new shops was begun early in 1913, and will be completed about January 1, 1914. The transfer of the Gorgona shop work and equipment to Balboa and other points, made necessary on account of the abandonment of the town of Gorgona consequent upon the rise in Gatun Lake, was effected and the old shops demolished during July and August, 1913. The new shop buildings are constructed of steel frames with roofs of heavy tile, made on the Isthmus. The sides and ends were left open for ventilation and light, protection from sun and rain being afforded by wide, overhanging eaves. All shop machinery will be electrically driven. Until future requirements are known, the marine shops at Mount Hope will be continued in service, and as Paraiso has been made dredging headquarters for the next few years, the old shop buildings at that point will be fitted up and used in making repairs to dredging equipment only.

Floor of the new concrete lumber dock at Balboa.

GOVERNMENT COAL AND FUEL OIL BUSINESS

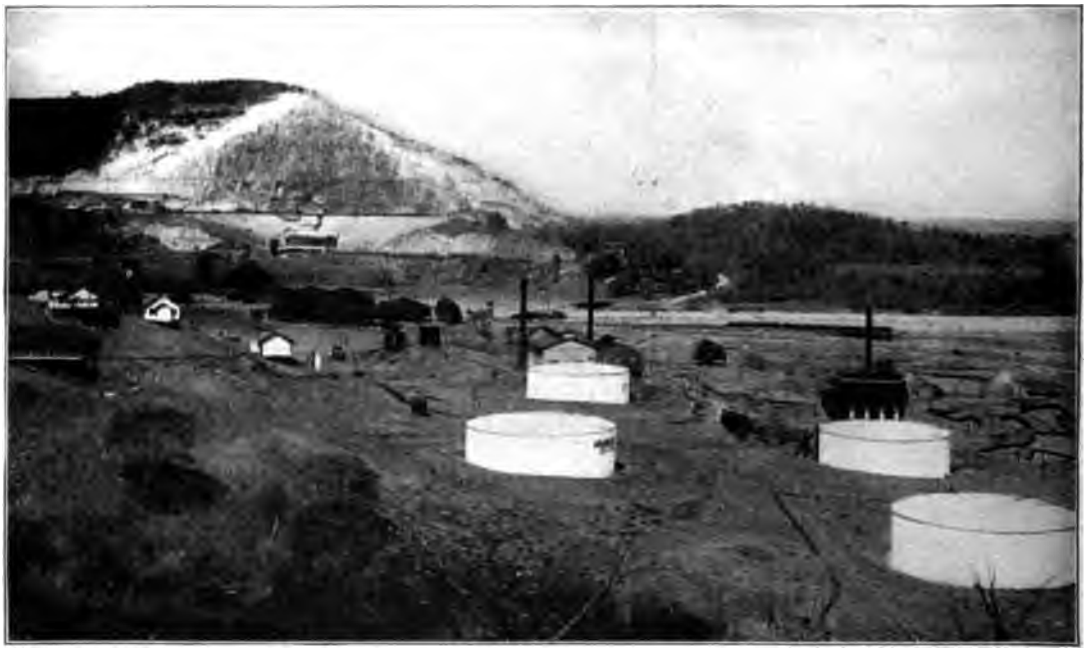
The main government coaling plant will be situated on the north end of an island, opposite Dock 11, at Cristobal, near the Atlantic entrance to the Canal. It will be from 1,700 to 2,000 feet in length, 300 feet wide, and will be capable of handling and storing 300,000 tons of coal. Subaqueous storage will be provided, as it has been determined that coal disintegrates less rapidly when under water than when lying exposed to the air. This plant will have railroad connection with the mainland by means of a bridge of the vertical lift type crossing the French Canal at a point between Cristobal and Mount Hope. The coaling plant on the Pacific side will be at Balboa, and will have a length of 500 feet, width of 340 feet, and water frontage of 1,300 feet. It will be capable of handling and storing 210,000 tons of coal, including 100,000 tons subaqueously. The coal-handling equipment for both plants was purchased in August, 1913, and at Cristobal consists of a system of unloading towers, stocking and reclaiming bridges, reloaders, and 10-ton automatic electric cars for conveying.

At Balboa, the equipment is much the same, with the exception that four of the double cantilever cranes used in building Pedro Miguel and Miraflores Locks were substituted for the stocking and reclaiming bridges. The cost of this equipment is $1,833,127, and deliveries are to be made in periods ranging from six to 30 months.

Facilities will also be provided at Cristobal and Balboa for supplying shipping and the Canal with fuel oil. To this end two steel tanks have been erected at each terminal with a combined storage capacity of 160,000 barrels.

PRIVATE COAL AND FUEL OIL STORAGE

There has been a lively interest shown on the part of dealers in coal and fuel oil in the United States and Europe in the selling possibilities of these two commodities on the Isthmus after the completion of the Canal. This display of interest induced the Government to make known its policy toward these enterprises in the early part of 1913. The plan announced is to keep complete control of the terminals, water frontage, and transportation by land and water across the Isthmus, and to that end, no land nor land under water that may be needed later by the United States will be leased. It will not be the policy of the Government, however, to monopolize the fuel business, and every means will be taken to encourage the establishment of private coal and fuel oil depots on the Isthmus under proper conditions. It is believed that the duplication of coal-handling machinery would be undesirable, and the Government, therefore, will install modern machinery ample for private, as well as for its own purposes. Acting under this theory, the Canal Commission in July, 1913, announced its readiness to assign space for fuel oil depots at either end of the

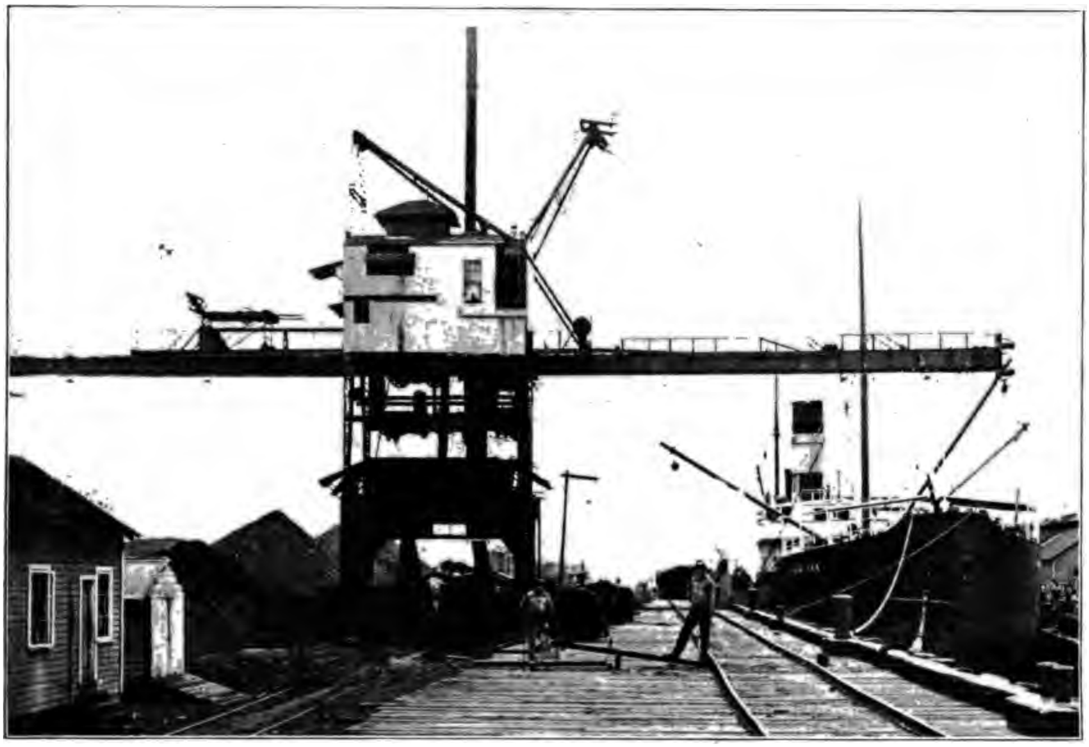


Oil storage tanks in the foreground. Ancon Hill in the distance.

Canal under revocable leases or licenses. Coal storage space will be similarly assigned. Private dealers, both in the United States and abroad, made some objection against the revocable lease plan, and in one or two instances expressed a preference to attend to their own coal-handling, but as evidence that the Government's plan is not discouraging these enterprises, applications had been received up to September 1, 1913, for 169,000 tons of private coal storage space at Cristobal, and 6,500 tons at Balboa. A number of applications had also been received for space for fuel oil tanks.

BONDED WAREHOUSES

The Canal Commission has not yet taken up the matter of bonded warehouses, and is probably reluctant to do so from the fact that the control of customs at the Canal Zone ports of Ancon and Cristobal is vested in the Panama Government. With the approaching completion of the Canal, the question has been agitated to some extent, and in the 1913 session of the Panama National Assembly, a law was passed that would permit bonded warehouses on Panamanian territory. Opposition to allowing private persons to erect warehouses developed, and Panama is now considering the advisability of building its own warehouses, with a view of leasing space therein.



Telpher plant, which has handled practically all of the coal used in the Canal work.

NEW FLOATING EQUIPMENT

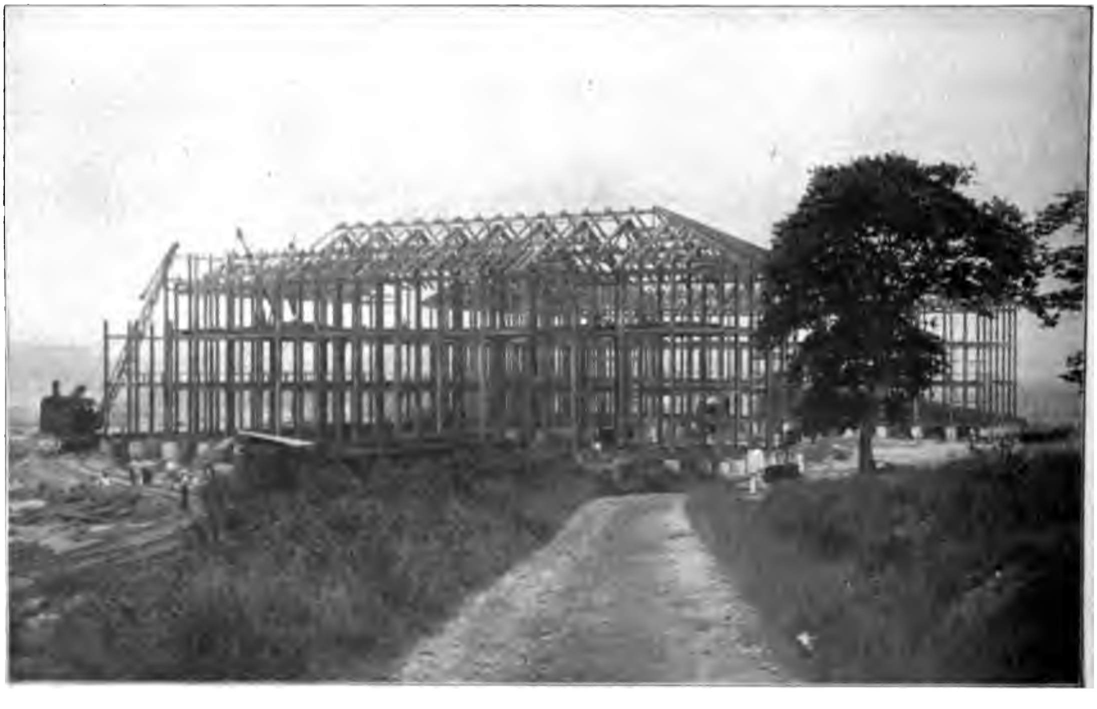
In order to insure the expeditious handling of the massive lock gate leaves, when repairs become necessary, as well as for commercial and other

Canal needs and general wrecking purposes, the contract for the erection of two floating cranes of the revolving type has been made to the Deutsche Maschinenfabrik A. G. of Duisburg, Germany, satisfactory proposals not having been received from American firms. Each crane is of 250 tons capacity, and consists of a steel pontoon 150 feet long, 88 feet wide, and of a depth of 15 feet nine inches at the sides, and 16 feet eight inches at the center, supporting a superstructure in three parts; first, a fixed mast; second, a revolving "bell," and third, an arm or jib, the latter provided with a main and an auxiliary hoist. The cranes will not be self-propelling, but will contain a power generating installation for the operation of the crane mechanism.

For handling vessels of the largest size at Cristobal and Balboa two powerful harbor tugs will be purchased. Two colliers, to cost not to exceed $1,000,000 each, and to have a cargo capacity of 12,000 tons each, have been authorized by Congress for use at the Canal termini.

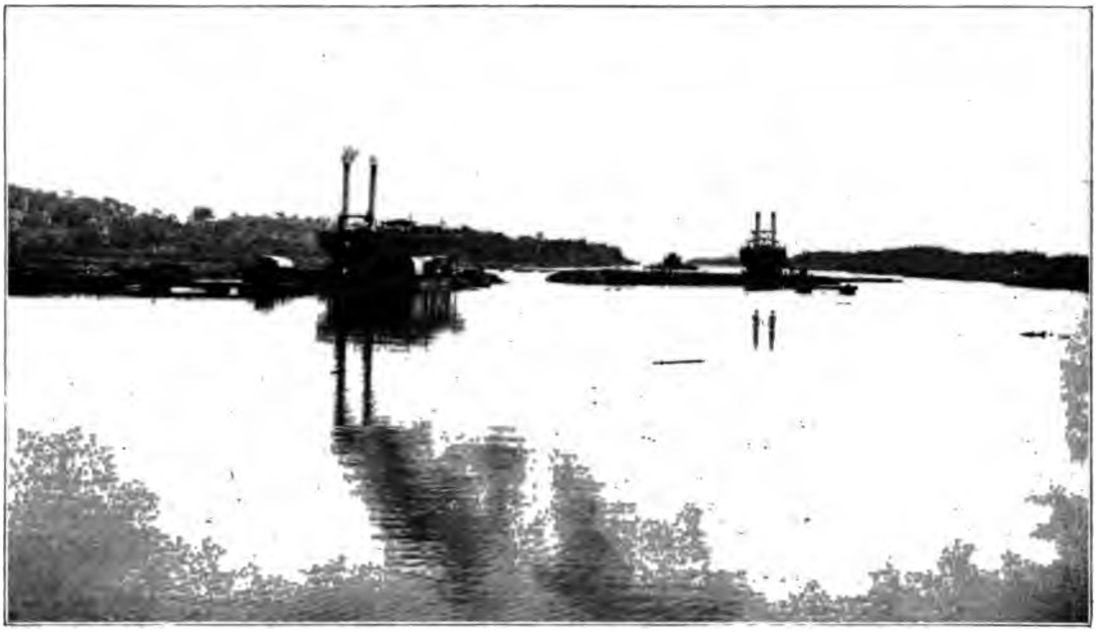
PERMANENT VILLAGES AND BUILDINGS

Much study has been given the type of construction of the permanent buildings of the Canal. In view of the depopulation of the Canal Zone, the number of permanent towns will be limited. Balboa will be the seat of government, and the headquarters for most of the employes in the administrative branch of the permanent organization. The operating force at Gatun Locks will live in the present villages of Gatun and New Gatun, and the force at Pedro Miguel and Miraflores Locks will reside in the new town which will be laid out on the fill at Pedro Miguel. The settlements at Ancon and Cristobal will be continued indefinitely. Bas Obispo, Las Cascadas, Empire, Culebra, and Corozal, together with a few smaller villages still existent, will eventually be



Permanent administration building on west side of Ancon Hill under construction. Overlooks the site on which the permanent town at Balboa will be laid out.

abandoned, leaving Pedro Miguel, Paraiso (temporary dredging headquarters), and Gatun as the only inland towns of the Zone. The villages in the lake area, Bohio, old Frijoles, Buenavista, Ahorca Lagarto, Tabernilla, San Pablo, and Mamei disappeared in 1911, when the lake first began to rise. With them vanished a number of old and familiar landmarks, such as Stephens' Tree, which encroached on the old Panama Railroad right-of-way near Ahorca Lagarto, and, although not a fact, was popularly supposed to mark the grave of John L. Stephens, one of the founders of the railroad. The villages of Gorgona and Matachin shared the same fate in July and August, 1913, and Miraflores was razed in September, 1913. Gorgona was one of the oldest and most populous settlements in the Zone, and as F. N. Otis narrates in his History of the Panama Railroad, published in 1867, was "noted in the earlier days of Chagres River travel as a place where the wet and jaded traveler was accustomed to worry out the night on a raw hide, exposed to the insects and the rain, and in the morning, if he was fortunate, regale himself on jerked beef and plantains." Gen. U. S. Grant, then Captain Grant, spent the night there while crossing the Isthmus prior to the advent of the railroad.



Dredges at work removing the last barrier in Atlantic entrance.

For the purpose of procuring a modern and permanent type of architecture, special architects have been employed, and to them has been committed the work of preparing designs for all permanent structures, including machinery control houses at the locks, water works, hydroelectric station, public buildings, and quarters for employes. A new administration building to cost about $475,-000 is under erection on the west side of Ancon Hill, overlooking from a knoll the new Balboa townsite. It will be constructed of structural steel and hollow concrete blocks. The remainder of the permanent buildings will probably be of concrete construction. The Balboa townsite will be laid off in accordance with the most approved ideas, and with the view of making it a model town, including the beautification of its surroundings, as well as the grounds about the locks, the services of a landscape architect were engaged in July, 1913. The Commission of Fine Arts was delegated by Congress to supervise the permanent building work, and it has made suggestions from time to time.

Docks at Cristobal under construction. With the Canal practically completed, the attention of the Canal Commission is being concentrated on the permanent terminal facilities. The present plans include extensive plants at Balboa on the Pacific, and at Cristobal near the Atlantic entrance.

PERMANENT ORGANIZATION

The Act of Congress of August 24, 1912, provides for the appointment of a governor of the Panama Canal, when in the judgment of the President, the work of construction shall be sufficiently advanced toward completion as to render the further services of the Isthmian Canal Commission unnecessary. The appointment is to be made by the President, by and with the advice and consent of the Senate, and is effective for a period of four years. The salary is $10,000 per annum. President Taft, previous to the expiration of his term of office, allowed the fact to become public that he intended to dissolve the Commission and appoint a governor. Some Members of Congress opposed the plan, one declaring that it was not the purpose of the Act to abolish the Commission until it had completed its work. President Taft's term expired without any further move in this direction.

With the advent of the Democratic administration, it was the general opinion that President Wilson would give the matter thorough study before taking any steps toward abolishing the Commission. This has proved to be the case, and it seems to be the common understanding that the President has formed the opinion that the status of the Commission should remain unchanged until the great work is entirely finished and the Canal ready to be officially opened. The health of one of the members of the Commission, Lieut.-Col. D. D. Gaillard became undermined in July, 1913, and he was obliged to return to the United States, at least temporarily. While no definite plans for the permanent organization have yet been announced, Colonel Goethals has stated in hearings before the Senate Committee on Interoceanic Canals that the estimated number of employes required for the operation of the Canal, exclusive of civil administration and sanitation, and of the military establishment, would be 2,500. The ensuing year will witness many changes, all tending toward the placing in effect of the permanent organization.

The new director, when appointed, will, in connection with the operation of the Canal, have control and jurisdiction over the Canal Zone, and will perform all duties in connection with the civil government of the Zone, which is to be held, treated, and governed as an adjunct of the Canal. The law provides for one district court with two divisions, one including Balboa, and the other including Cristobal, each court to have jurisdiction in felony cases, and in all causes at equity, admiralty, and all cases at law involving sums exceeding $300. In addition to a district judge, there will be a marshal and district attorney, each holding office for four years. The Circuit Court of Appeals of the Fifth Circuit of the United States at New Orleans, will have jurisdiction in all appeal cases. The provision of the law requiring trial by jury has already been made operative by the President's Executive Order of July 4, 1913.

WIRELESS COMMUNICATION

The Darien naval radio station to be built at Caimito, a point in the Canal Zone about midway between Colon and Panama, will be one of the most power-

New dock No. 16 at Colon under construction. Part of the Cristobal terminal system.

ful in the world, and will establish direct communication between the Isthmus and Washington. In power it will be the same as the Government's station at Arlington, but in the size of its towers, it will exceed the latter. The sending and receiving radius will be nominally 3,000 miles, so that communication may be held direct with the Arlington station, instead of *via* Key West, as formerly. It will be able to send messages as far as Valdivia, Chile, 421 miles south of Valparaiso; to reach a vessel anywhere along the eastern coast of the United States, or midway between New York and Gibraltar; and to communicate with the island of St. Vincent, 500 miles west of Africa. There are three other wireless stations on the Isthmus, not including one at Bocas del Toro, maintained by the United Fruit Company. These are at Porto Bello, Colon, and Balboa, and all are in charge of the Navy Department. One, or more, of these plants will probably be dismantled when the new high power station becomes available. In 1912, President Taft signed an Executive Order prohibiting the establishment of wireless stations on the Isthmus by other parties within the radius of 15 miles of any Government station.

BEAUTIFYING THE CANAL

The Panama Canal Act of August 24, 1912 contained the following provision:

"Before the completion of the Canal, the Commission of Fine Arts may make report to the President of their recommendation regarding the artistic character of the structures of the Canal, such report to be transmitted to Congress."

In accordance with the above, the chairman of the commission, Mr.

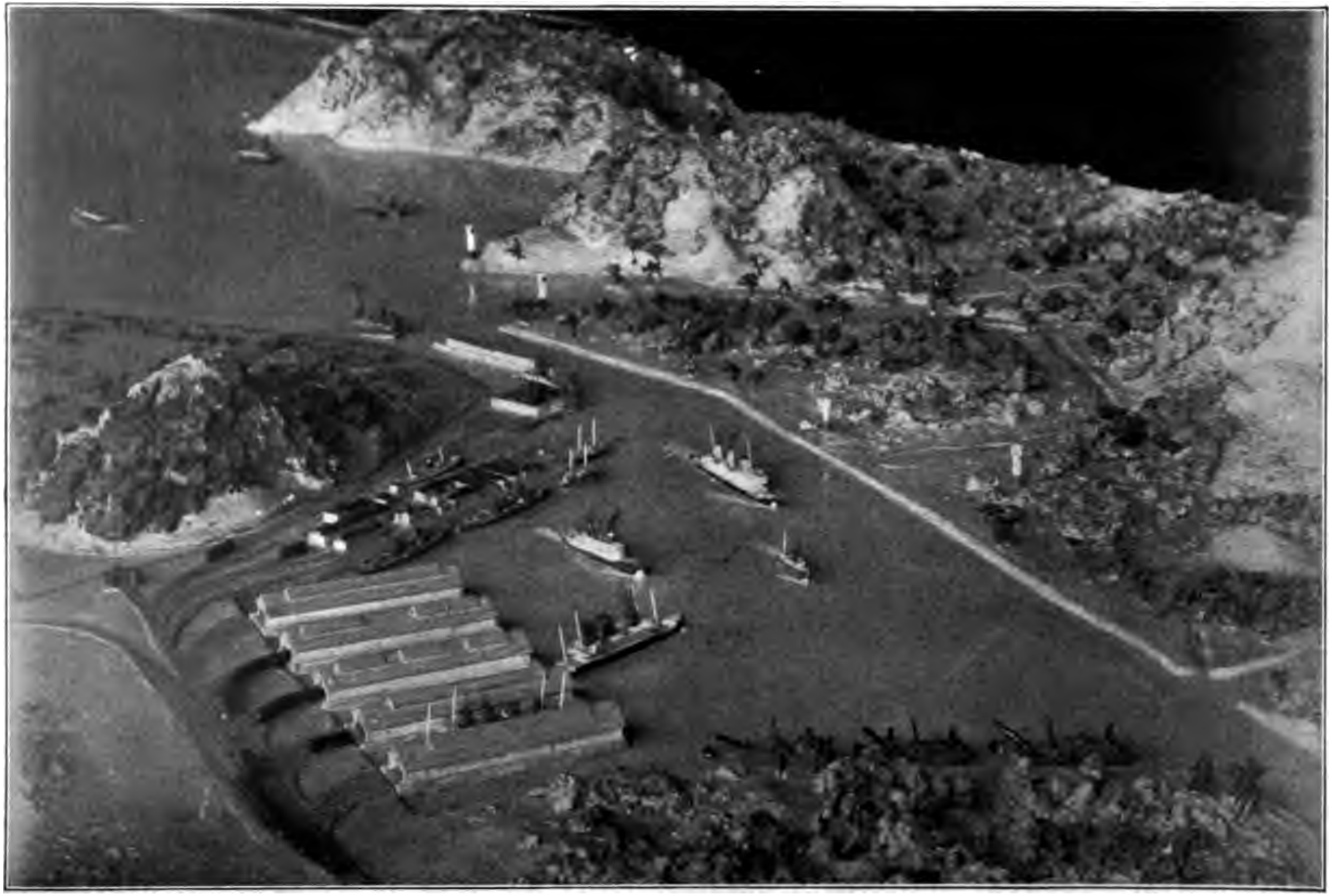
Along a country road. This picture vividly portrays the pretty scenery that greets the eye in traveling over some of the Canal Zone roads.

Daniel C. French, sculptor, and the vice-chairman, Mr. Frederick Law Olmsted, landscape architect, spent a part of the month of February, 1913, on the Isthmus. Their report submitted to Congress on July 26, 1913, states in part:

"The Canal itself, and all the structures connected with it impress one with a sense of their having been built with a view strictly to their utility. There is an entire absence of ornament and no evidence that the aesthetic has been considered, except in a few cases as a secondary consideration. Because of this very fact there is little to find fault with from the artist's point of view. The Canal, like the pyramids, or some imposing object in natural scenery, is impressive from its scale and simplicity and directness. One feels that anything done merely for the purpose of beautifying it would not only fail to accomplish the purpose, but would be an impertinence. In such a work the most that the artist could hope to do would be to aid in selecting, as between alternative forms of substantially equal value from the engineering point of view, those which are likely to prove most agreeable and appropriate in appearance."

A pretty scene in the outskirts of Culebra Village.

The report, however, made a number of suggestions calculated to improve the appearance at the Canal entrances, at the locks, in the permanent towns, and the marine and army reservations. It also strongly recommended that a memorial record of the building of the Canal be made in the form of an impressive inscription upon a great monumental surface on the east bank of Culebra Cut, at the point of deepest cutting, 492 feet. It favored a space 100 feet in height and somewhat more in width, severely simple in design, with lettering in Roman V-shaped letters large enough to be easily read by normal



Model showing the Pacific entrance to the Canal and the docks and inner harbor at Balboa, as they will appear when completed.

eyes across the Canal, and that the material should be concrete applied as a massive facing to the irregularly fractured trap rock of the cliff. It also suggested marking the highest point of Canal excavation on Gold Hill, immediately over the proposed inscription with some form of monument.

The Southern Commercial Congress made formal application of the Secretary of War, in October, 1913, for permission to place at some prominent point along the Canal a bronze tablet, four by six feet in size, carrying a medallion life size bust of the late Senator John T. Morgan of Alabama, and legend reciting his relations to the Canal idea. Permission was accorded, and the tablet was placed near the north end of Culebra Cut in November, 1913.

Model showing the Atlantic entrance to the Canal and the docks at Cristobal, as they will appear when completed.

PERMANENT ADMINISTRATION BUILDING, BALBOA

The permanent Administration Building of the Canal Zone now under construction in accordance with the design made by Austin W. Lord of New York City, formerly architect to the Commission, and Mario J. Schiavoni, former assistant architect, Culbera, under whose direction the entire plans, elevations, details, and specifications have been developed, is the result of many efforts to obtain a building suitable to the requirements as stipulated by the Chairman, and the very important requirements in providing protection against sun and rain.

The architecture of Italian renaissance design, with a square column colonnade, and a second-story balcony treatment around the three exterior elevations of the building and surmounted by a somber red tile roof, will present a character very much to be desired in this climate; viz.: wide projecting eaves and deep recessed colonnades, affording excellent protection against sun and rain.

The court side, facing northeast, enclosed by the two side wings, will have plain wall surfaces, treated with pilasters and window openings of same proportions as on the exterior elevations, and a central wing housing the main stair motive and *porte cochere* entrance, the entire plan having the form of the letter E with the first floor situated 100 feet above sea level.

The office areas are to be treated in a very simple manner with the walls and ceilings treated in white plaster, the floors in yellow pine, and mahogany for all woodwork.

The rotunda motive, the focal point of interest, entered from both front and rear elevations, and situated between the front entrance and the main stair hall, facing the court, will be treated in a very dignified but somber renaissance style with a coffered dome, surmounting decorative paintings illustrating the various periods of canal construction in a continuous frieze and in four large panels. The rotunda will be illuminated by a dome light under a skylight, thereby producing on a minor scale the Pantheon at Rome. The walls, floor, and staircases, will be treated in a simple marble and Caen stone treatment in harmony with the balance of the work.

The building will have an area of 60,000 square feet of clear office space for the three floors, plus the required areas for the rotunda motive, halls, staircases, toilets, exterior colonnades, and balconies. The basement, with an area of 32,000 square feet, will be used as a vault for the filing of records, maps, archives, etc.

The total floor area in the building taken at grade will amount to 37,772 square feet, and the total (mean) cubic content of the entire building, 2,153,000 cubic feet.

A very flexible system of electric lighting, telephone, and buzzer system has been provided for, including the permanent telephone exchange, which will be located on the third floor in one of the rear wings.

Every convenience of reasonable necessity has been provided for in this building, such as fire protection, vacuum system, etc., thereby setting an example for future buildings by making this the most extensive and up-to-date steel frame and hollow concrete tile block structure that is being built on the Isthmus as a keynote for future work.

COST OF THE CANAL

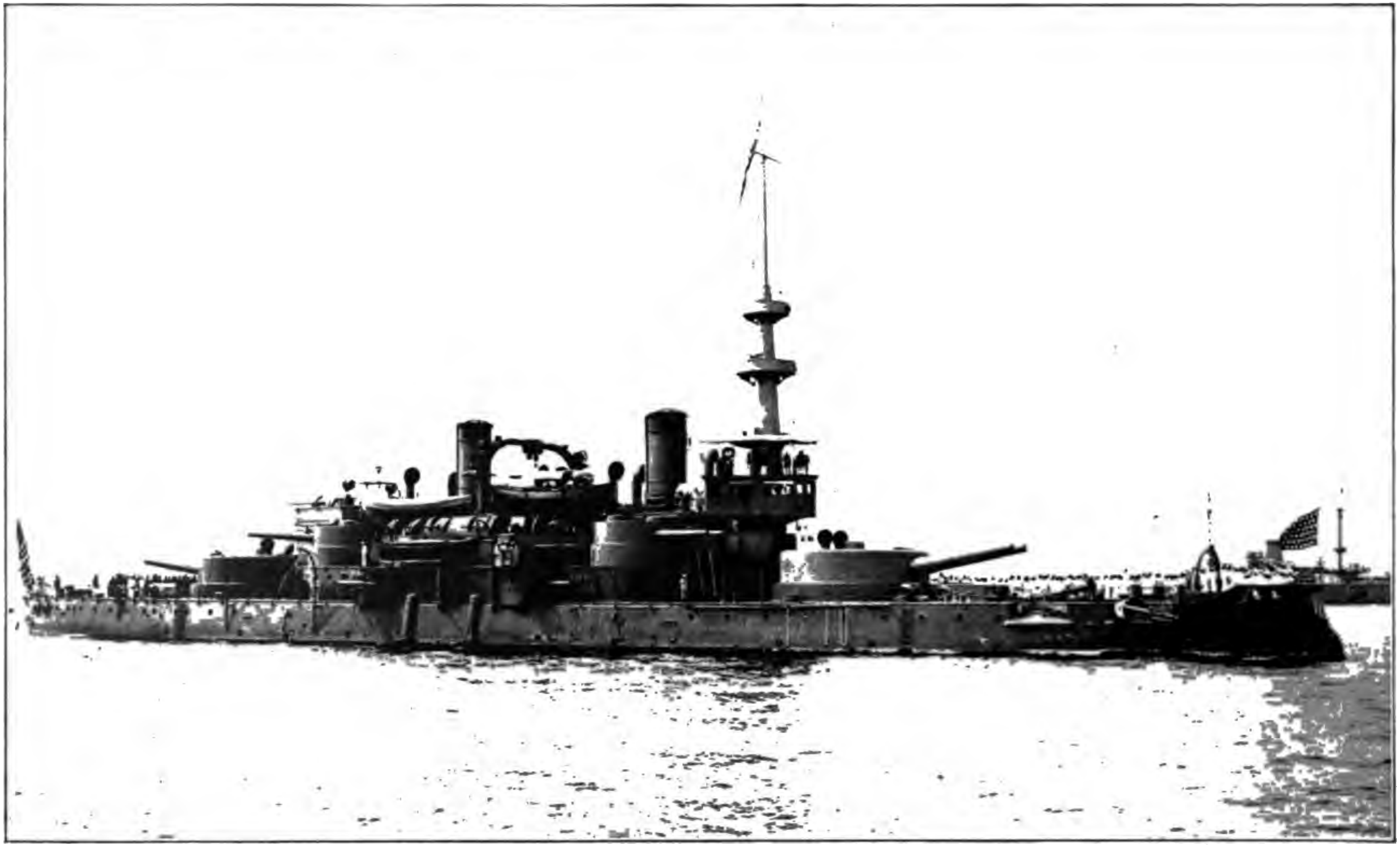
The estimate of October, 1908, placed the cost of the Canal at $375,201,000 divided, as follows: Construction and engineering, $297,766,000; sanitation, $20,053,000; civil administration, $7,382,000; paid to the New French Canal Company, $40,000,000; paid to the Republic of Panama, $10,000,000. The appropriations made by Congress to date aggregate $338,828,273.14 for the Canal work, and $10,767,950 for fortifications. The actual expenditures to June 30, 1913 were as follows: Construction and engineering, $185,316,095.75; sanitation, $16,250,164.93; civil administration, $6,393,308.73; law, $44,982.27; general items, $87,866,903.70; fortifications, $3,114,357.52. Total $298,985,812.90. Since 1908, the force has increased so much in efficiency, with a corresponding decrease in unit costs, that it seems probable that $360,000,000 will cover not only the cost of the Canal work, but of the fortifications as well.

FUTURE CANAL TRAFFIC

THE volume of traffic that will pass through the Panama Canal after it has been thrown open to commerce of the world is largely a matter of speculation. The importance of the new waterway from a military standpoint is easily recognizable, and in the minds of American Army and Navy experts, the probable fact that the efficiency of Uncle Sam's Navy will be about doubled, alone warrants the enormous cost which the project has entailed. In commercial circles, however, the question of the hour is "Can the Canal be made to pay?"

To ascertain the probable amount of tonnage that will use the Canal during the next few years, the United States Government, on September 1, 1911, engaged the services of the highest American authority in this line, Dr. Emory R. Johnson, professor of transportation and commerce in the University of Pennsylvania. As special commissioner on traffic and tolls, Dr. Johnson has made an exhaustive investigation of the subject from all points of view, the results of which have been incorporated in a printed volume of 500 pages. His conclusions may be briefly summed up, as follows:

"The shipping using the Panama Canal annually during the first year or two of its operation, that is, in 1915 and 1916, will amount to about 10,500,000 tons. At the end of 10 years, the tonnage will doubtless have reached 17,000,000 tons. The prospect is, therefore, that the Panama Canal will start with less than half the tonnage which will then be making use of the Suez Canal. Moreover, it will be a long time before the Panama Canal catches up with the Suez waterway in volume of traffic. Should the Suez tonnage continue to increase at the present rate, the volume of shipping served by the Suez route in 1925 will be double that passing through the Panama Canal. It is hardly probable that the Suez tonnage will increase at its present high rate, while it may well happen that the stimulating effect of the Panama Canal upon industry and trade has been underestimated. Eventually, at the end of two or three decades, let us say, the traffic at Panama may equal or exceed that at Suez."



The United States Battleship *Oregon*. Undoubtedly, the famous trip of the *Oregon* around South America, in 1898, to join the squadron before Santiago, had much to do toward crystallizing public sentiment in favor of an American Canal, at least, it brought the matter into prominence from a military point of view. **An effort is being made, and public sentiment may demand, that the *Oregon* be given first place for the official trip through the Canal.**

Dr. Johnson gave publicity to the above forecast in 1912, and his frank admission that his figures may be underestimated indicates that it is not in the power of man to closely foretell the volume of traffic the Canal will attract. It is only within the past twelvemonth that steamship companies, and firms engaged in the wholesale coal and fuel oil trade, have awakened to the possibilities evoked by the Canal. If reports that are constantly noted in the daily press are true, nearly every company engaged in ocean transportation in this part of the world is perfecting plans for building additional ships in anticipation of the increased business the Canal will create. Since fuel oil and coal-handling facilities at the Canal termini were planned, and the policy of the Government in respect to the sale of these two commodities by individuals and companies, on the Isthmus, was outlined, there has been an unexpected amount of interest shown in this feature by firms in the United States and Europe. Applications for coal storage space had, prior to the awarding of the coal-handling machinery, been so much greater than anticipated, that enlargements of the proposed layout in some of its essentials became imperative. Close observers of the trend of the times say that Dr. Johnson's figures are sufficiently conservative.

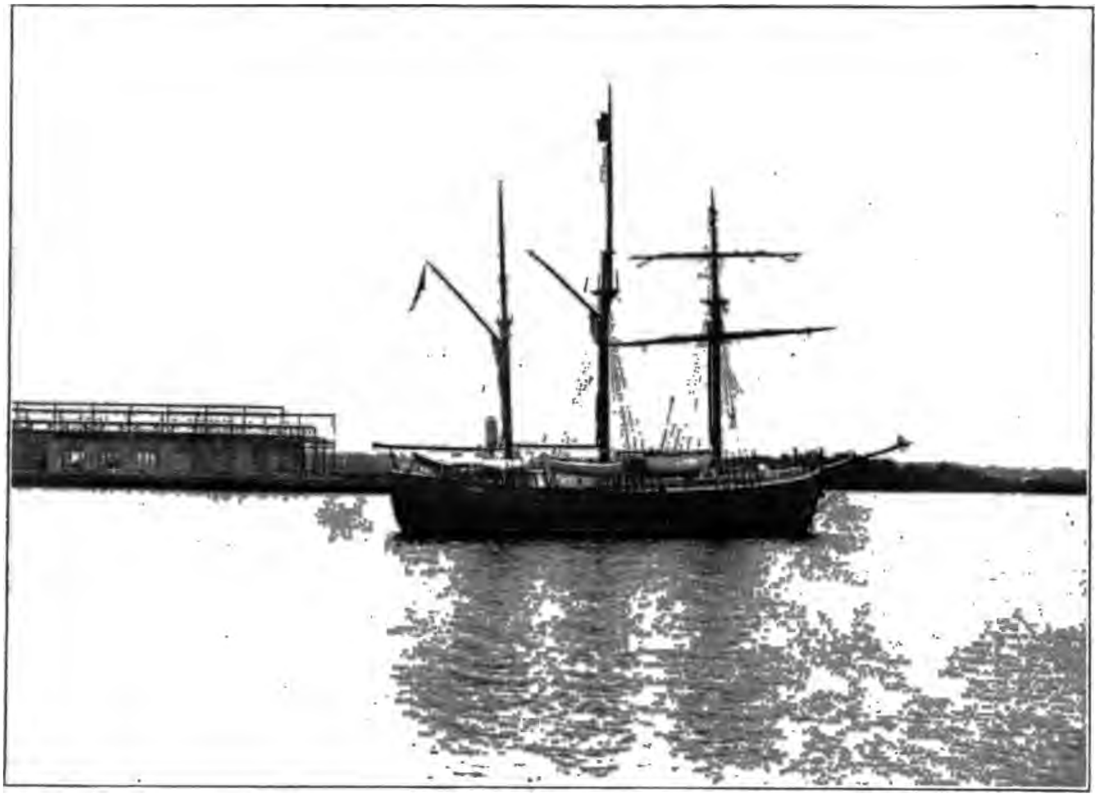
The tourist steamer Evangeline, the first vessel to dock at Pier 16, Cristobal, January, 1913.

Latin-America, particularly the west coast of South America, is confidently counted on to contribute largely to the tonnage of the Canal. Chile, Bolivia, Peru, and Ecuador, all originate a large freight traffic. The nitrate fields of Northern Chile yield an annual product of more than 2,500,000 tons, four-fifths of which goes to Europe, and the remainder to the United States; copper shipments from Peru and Bolivia are increasing annually in importance with the opening of additional mines and the construction of railroads. Rail-

Atlantic entrance to the Canal, showing shipping at the Panama Railroad Docks.

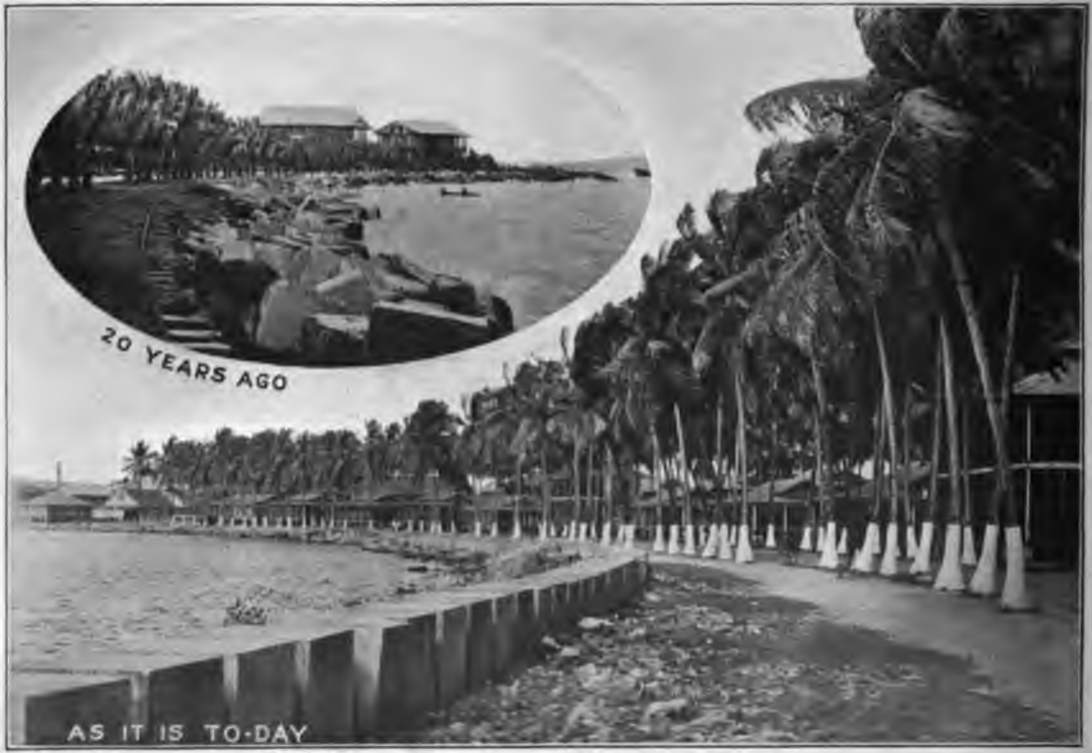
road building in those countries, south of the Equator, has enjoyed a tremendous expansion in the last few years. Argentina has been brought in touch with Valparaiso by the Andean tunnel, and the products of the western part of that republic will, in all probability, be shipped through the Canal. The port of Valparaiso, which was almost destroyed by an earthquake in 1906, has fully recovered from its effects, and has contracted for port works costing millions of dollars in anticipation of the opening of the Canal.

At present, American commerce plays but a minor role in the west coast trade, although, owing to the increasing number of American investments, the trade is improving. Germany and Great Britain have long had the lion's share, and it will be many years before their hold can be broken. The fault is our own. European emigrants, and representatives of European firms, went to those countries in an early day; they intermarried with the native residents, and many became citizens who afterward rose to prominence in public life. On the other hand, prior to the Spanish-American War, these countries knew few Americans, with the exception of tourists. We kept to our own borders, and established neither social nor business relations, and as for going there to live, it was not to be thought of. Moreover, the American manufacturer has in the past shown scant desire to cultivate business relations with his Latin-American neighbor; they have elected to ignore his requirements, and scoffed at his business customs. The European never commits this *faux pas*.



The Polar Ship Fram, lying at anchor in Cristobal Harbor. This boat left Buenos Aires on August 14, 1913, and reached Colon on October 3, for the purpose of passing through the Canal on its way to San Francisco. It will be one of the first vessels to make the passage.

Moonlight on Limon Bay. When the rose and mauve and green have faded, the tropical moon appears, which is nowhere more effulgent than on the Isthmus.



Roosevelt Avenue, the prettiest street in Cristobal, overlooking Limon Bay and the Atlantic entrance to the Canal. The beauty of this street and the outlook has been marred by the building of the docks at this point.

The Spanish-American War was the entering wedge; the Panama Canal and other large projects in Central and South America requiring American brain and brawn has widened the opening, until today one will find plenty of Americans scattered all over Latin-America. A large percentage of those who enlisted in the Philippine, Cuban, or Porto Rican campaigns, those who have seen service on the Panama Canal, or those who have engaged in railroad and mining work in Brazil, Peru, or Chile, never go back to the United States to reside permanently. Some of them leave the tropics with the avowed intention of never returning, but sooner or later, one will find them at a steamship office engaging passage southward bound. The lure of the tropics is not easily overcome.

Native town at Culebra. Negro village of Golden Green in middle distance. These villages will be abandoned in course of time.

The Americanizing of Latin-America has only just begun; it would not have been begun yet but for those prime factors, the War and the Canal. As Americans locate in Central and South America, the call grows more and more insistent for conveniences to which they have been accustomed—American banks, clubs, newspapers, stores, and merchandise. The influence of the Latinized American is seen in the gradual improvement of conditions, all of which, while minute in detail in connection with the trade of the Canal, has a direct bearing on its future so far as it concerns traffic with South America.

The Panama Canal will place the United States and Europe about on a par so far as it concerns the commerce of Australia and New Zealand. The same is true of Japan, China, and the Philippines. The short route from

Europe to the Orient is by way of Suez; the short course from the Atlantic coast of the United States to Japan and most of China will be by way of Panama. A 10-knot freight steamer will be able to make the voyage from New York to Yokohama by way of Panama in 15 days' less time than it now takes by way of Suez. Hong Kong and Manila will be equally distant from New York by way of Panama or Suez.

The tonnage through the Suez Canal has shown a steady growth. In 1910, it was 16,500,000 tons; in 1912, it had increased to 20,275,000 tons, representing the passage of 5,373 vessels. The Suez Company in commenting on the approaching opening of the Panama Canal said, "It does not seem likely that any considerable amount of freight between Europe and ports beyond Suez will be diverted by the Panama Canal. It is to be feared, though, that one of the results of the opening of the new route will be the attendant competition, and possibly a newborn trade between the eastern states of America, and the Far East and Oceanica." The increase in Canal traffic is not confined to the Suez, for, in July, 1913, 3,670 vessels carrying 12,278,000 tons of freight passed through the Sault Ste. Marie Canal, a larger volume than Dr. Johnson predicts for the Panama Canal during the first year or two of operation.

While much has been printed to show how the freight business will be advantaged by the Panama Canal, there has been but little mention of the passenger traffic. It is quite certain that travelers to South America, or to the Orient, will prefer the Panama route to the long and usually tempestuous voyage around South America, or to the terrific heat of the Red Sea. The passage

A street in the American settlement at Empire, showing family quarters. The landscape in and about Empire is justly considered the most effective in the Canal Zone. The short palms grow here in great profusion.

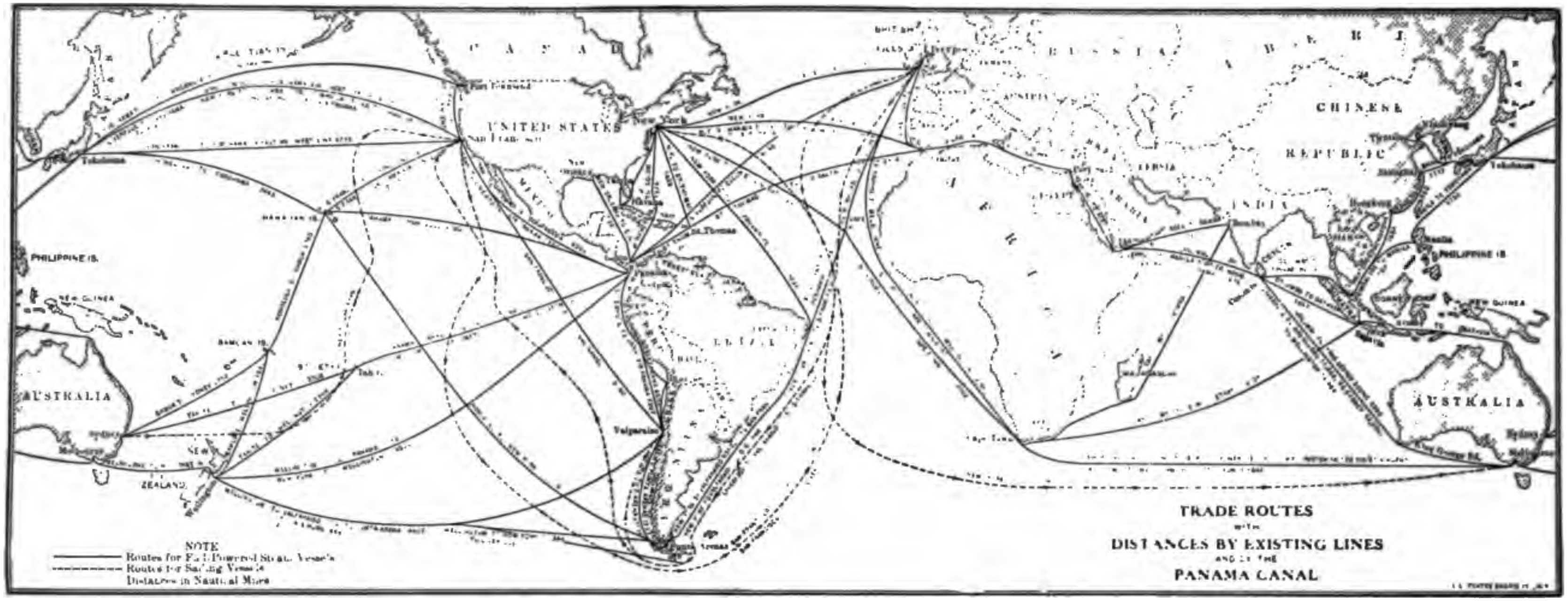
Main entrance to the new Hotel Washington, Colon.

through the Panama Canal will afford an opportunity for the tired traveler to land, and if he so desires, to cross the Isthmus by rail. The Isthmus, therefore, will be a sort of clearing house for passenger traffic. People coming from Europe and eastern or southern United States will change there for the Orient, western United States, and western South America.

The closing years of the construction period of the Canal has attracted a growing number of tourists, until at the present time, it is just as much a booking point for the tourist agencies as any other place of interest the world has to offer. Statistics compiled to July 1, 1913, show that about 75,000 people have visited the Canal since January 1, 1910, over one-half of that number within the past 18 months.

The following table of comparative distances will show some of the shortening of routes the Panama Canal will effect:

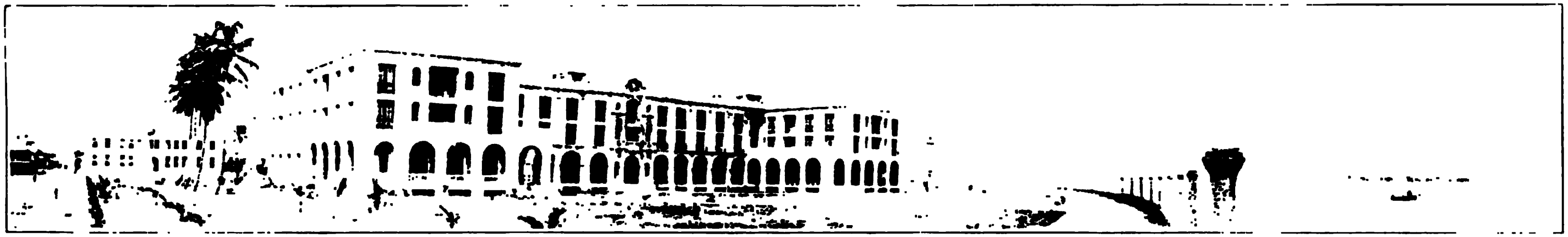
A typical street in Cristobal. There are cocoanut palms on every street in this pretty Canal Zone settlement, while banana trees and other tropic growth adorn the grass plots in front of the houses.



DISTANCES FROM NEW YORK, NEW ORLEANS, AND LIVERPOOL TO VARIOUS PORTS.

To	FROM NEW YORK			FROM NEW ORLEANS			FROM LIVERPOOL		
	Via Panama	Via Magellan	Via Suez	Via Panama	Via Magellan	Via Suez	Via Panama	Via Magellan	Via Suez
San Francisco..	5,262	13,135	....	4,683	13,551	....	7,836	13,502	....
Port Townsend	6,032	13,905	....	5,453	14,321	....	8,606	14,272	....
Honolulu	6,702	13,312	....	6,123	13,728	....	9,276	13,679	....
Guayaquil	2,810	10,215	....	2,231	10,631	....	5,384	10,582	....
Callao.........	3,363	9,613	....	2,784	10,029	....	5,937	9,980	....
Valparaiso	4,633	8,380	....	4,054	8,796	....	7,207	8,747	....
Manila	11,548	....	11,547	10,808	....	12,947	13,961	....	9,701
Hongkong......	11,190	....	11,628	10,611	....	13,031	13,764	....	9,785
Yokohama......	9,798	....	13,079	9,098	....	14,924	12,251	....	11,678
Shanghai.......	10,645	....	12,384	10,070	....	13,833	13,274	....	10,637
Melbourne.. ...	9,945	....	13,009	9,813	....	....	12,574	13,219	11,654
Wellington	8,851	12,852	14,387	8,272	11,760	....	11,425	11,711	12,989
Bombay	14,982	....	8,186	....	....	....	17,610	....	6,226
Colombo	14,112	....	8,629	....	....	....	16,740	....	6,736
Singapore......	12,522	....	10,177	....	....	....	15,151	....	8,329

Dying jungle in the lake region.



The new Hotel Washington and grounds. Atlantic entrance to the Canal to the right.

Birdseye view of Colon from the Bay.

Birdseye view of the Pacific entrance to the Canal. The fortified islands may be seen in the distance to the left.

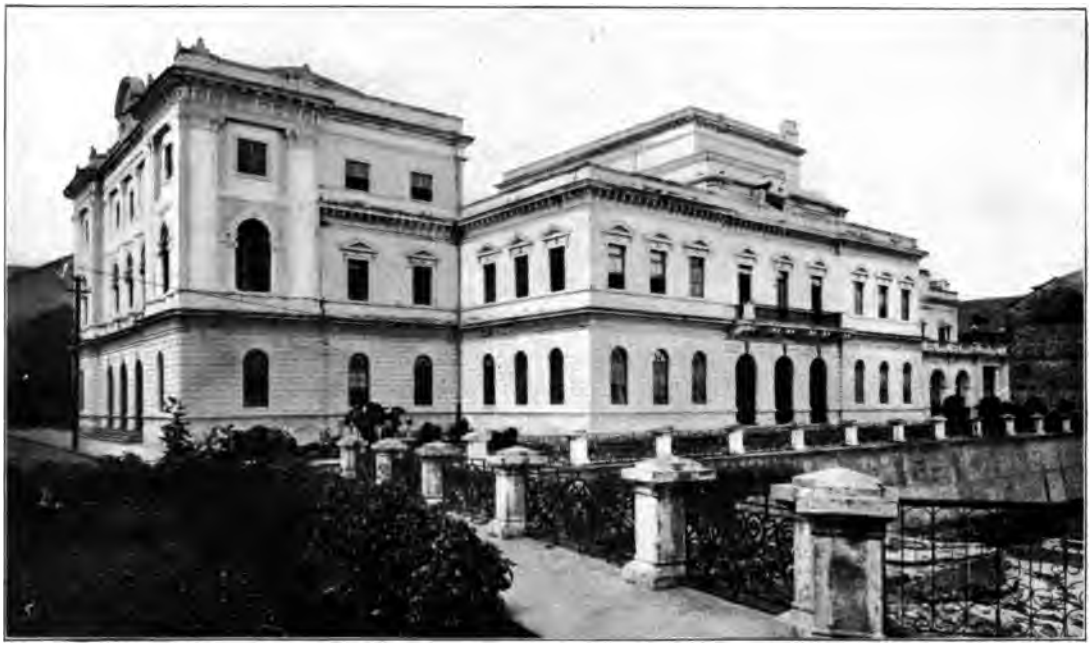
REPUBLIC of PANAMA

THE Panama of today affords a striking contrast to the Panama of yesterday. Although only a decade has elapsed since it became a republic and self-governing, the country has made a wonderful stride forward in progress and well-being. It cannot be supposed that this change would have been wrought so rapidly without the beneficent influence of its Northern mentor, for years of tyranny, of bickerings, of petty jealousies, and of political dictation generally leave an impress not easily eradicated. The Panama of revolutionary times when lust for power ruled, and when brother rose up against brother for no reason on earth save to depose an administration unpopular with some particular faction, is no more. Yet some of the older citizens sigh for the good old days, when, as the saying is "A revolution was born every minute." A newer generation is springing up, a generation that knows naught of war, and whose mission it will be to enter heartily into the arts of peace and husbandry, for the art of war is one from which Panama is forever divorced, and "Pro Mundo Beneficio" (For the benefit of the World), is its adopted motto for the future.

The history of Panama after the raids of the buccaneers is a history of countless revolutions, of plot and counterplot, of intolerable exactions on the part of the mother country, and of repeated attempts at independence. Like nearly all Latin-American countries, there were two main parties, Liberal and Conservative. When not welded together for the moment in indignant protest against some special act of injustice on the part of parent Colombia, these parties in Panama were continually fighting for control of such offices as Colombia permitted it to fill. A constitutional election was unknown up to a year ago, and victory at the polls was usually dependent on fraud, and by right of might. The Conservatives, who, in the past, represented the more prosperous element, generally held the reins of power, and instead of using this power for the good of all the people, treated their political opponents as personal enemies entitled to no consideration.

The revolution of 1900-1902, one of the most sanguinary struggles in which the Isthmian partisans ever became engaged, was started in Colombia, where the Jesuits, who constituted a dominant factor in affairs of church and state, had started a campaign against the Liberals. The fight involved every settled part of the Isthmus, and the failure of the local Liberal army to win victory at that time was due to the generosity of Gen. Emiliano Herrera, who laid siege to Panama City, and who, willing to give the women and children a chance to escape the bombardment, postponed his attack, thereby giving the enemy opportunity to strengthen its defenses. Dr. Belisario Porras, the present Chief Executive of Panama, was one of the principal Liberal leaders in this campaign.

DR. BELISARIO PORRAS,
President of the Republic of Panama.



National Palace and Theatre, Panama City. It cost $1,000,000 and is the finest edifice in the Republic of Panama.

The last revolution, that of November 3, 1903, when Panama seceded from Colombia, was a bloodless affair, devoid of spectacular incident, but it gave birth to a new republic and made the Panama Canal an assured fact. The part that the United States took in the event has been discussed pro and con. It suffices to say that while the American Government did not actively interest itself in the cause, it smiled broadly at the plot, and prevented any chance that the Colombian troops might have had to avert the disaster, by prohibiting their transport over the Panama Railroad on the pretext of keeping the transit clear, which was all the Panameños wanted.

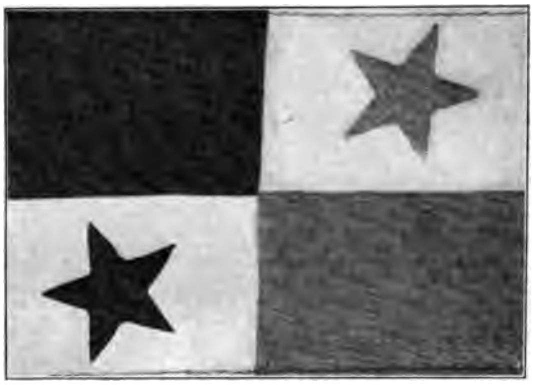
The "handwriting on the wall" was seen when the Colombian Congress deliberately turned down President Roosevelt's generous proposal for the purchase of the Canal strip at $10,000,000. On their own admission they wanted more, for the reason they thought they could get it by asking for it. Roosevelt's hidden note of warning should have been enough, but Deputy Velez and his followers thought they would call what they regarded as a bluff—and they did, but with an unexpected result. The Isthmians knew the temper of their compatriots, so the action of the Colombian Congress was no surprise to them. The treaty was defeated by Colombia on August 12, 1903; the flag of the new republic was raised on November 3, three months later; Panama was

Electioneering in the interior of Panama is done on horseback. The man in front, under the flags, was one of the candidates for President in the last election.

recognized by the United States on November 6, 1903; the Canal treaty with Panama was signed at Washington on November 18, 1903; it was ratified by Panama on December 2, 1903, and by the United States Senate on February 24, 1904. Quick work all around.

THE PANAMA FLAG

Miss Maria Emilia de la Ossa, a niece of the first president of Panama, Dr. Manuel Amador Guerrero, is the designer of the flag of the republic, which was hung from the balcony of Dr. Amador's house on November 4, 1903, when the Declaration of Independence was signed in Cathedral Park. The flag was presented to President Roosevelt when the United States recognized the independence of Panama. The two stars that adorn the banner represent the two national parties, Liberal and Conservative.



The two stars in the flag are red and blue on white background; the opposite corners are red and blue, making the combination red, white and blue.

NATIONAL HYMN OF THE REPUBLIC OF PANAMA

Chorus

Panama! Land of all our Devotion!
Hail to thee, Union true, Union grand!
Speed thy glory from ocean to ocean!
To our Nation we pledge heart and hand!
Speed thy glory from ocean to ocean!
To our Nation we pledge heart and hand.
Like the surge on our shore ever sounding,
In each heart rings the song of the Free;
Peace and Love with their wings all surrounding,
Loyal sons give their lives unto thee.
Onward still be the course of our Nation,
As the waves of the deep swiftly glide,
Thro' the Age shall our land take its station
With the grand of the earth side by side.

'Tis to thee, Land of Love, we are plighted,
And the din of the strife now is o'er,
Once again, brothers all, we're united,
While the Flag of the Free guards our shore!
Brightly gleams now the star of our Union
Still for Peace and for Fame may it shine,
All our hearts and our lives, in communion,
Till the last stroke of Time shall be thine.

THE RECONSTRUCTION PERIOD

The period 1904-1912 may be termed one of reconstruction. The blighting influence exercised by Colombia over Panama made the latter, in many respects,

The high lands offer a pleasant and cool climate where all vegetation peculiar to the tropical zone flourishes. The scenery along the streams is fine; ferns and orchids of many kinds abound and splendid hardwood trees tower over the evergreen underbrush.

100 years behind the times. The new government made a good start by disbanding its small army late in 1904. The army in nearly every Latin-American country is a bone of contention for the opposing political factions, for success is practically assured in case the aspirant for the presidency wins over the army. In the case of Panama, Gen. Esteban Huertas, the commander-in-chief of the army, who, by casting in his lot with the Panameños, made the secession movement doubly assured, became discontented a year later, and framed a plan for unseating President Amador. The plot was uncovered, Amador appealed to the American Legation, and Huertas was plainly advised that if he made one move the American marines would take the situation in hand. No move was made and this act marked the end of Panama's standing army. Panama needs

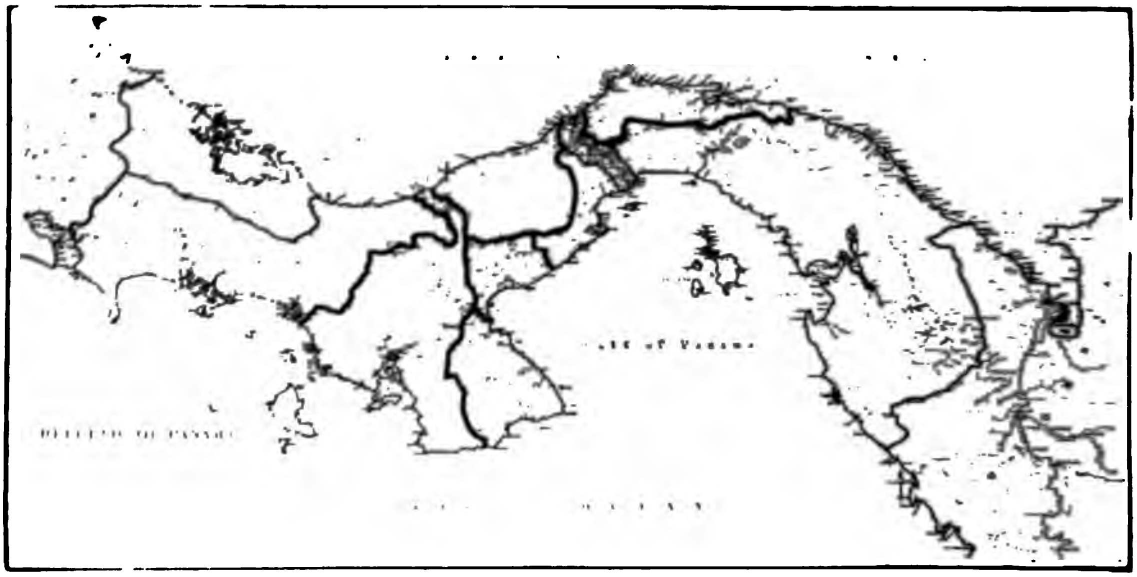
Christening of the Panama Flag, November 3, 1903, the date of the last revolution in Panama.

no internal system of defense, as peace is forever guaranteed by the United States.

The American Government exercises over Panama a mild form of guardianship. It will prevent any intrusion by outsiders; it will safeguard its health, and, in case of necessity, supervise its elections. It will not, as many think, annex Panama. Former President Taft, when Secretary of War, gave advance notice of what the policy of the United States toward Panama would be in December, 1904, when, speaking to an out-of-door assemblage from the balcony of the Hotel Central, in Panama, he said:

"My government does not covet one cent of Panama's money, or one foot of her land, but in the face of a probable outlay of $300,000,000, it is absolutely essential that a thorough and close understanding be maintained between the two governments."

This attitude has been religiously observed, and, barring the possible



some rash act on the part of Panama, remote at best, will continue to be observed.

"THE LAND OF THE COCOANUT TREE"

Crook your finger slightly, and you will have a fair idea of the American Isthmus, practically the whole of which is included within the limits of the Republic of Panama. The area of the country can only be estimated, as no actual survey has ever been made; and is approximately 32,000 square miles, based upon the east and west boundaries, as claimed, for, to date, neither the frontier on the Costa Rica side, nor that bordering on Colombia, has been determined. The Panama-Costa Rican boundary question was submitted for arbitration to former President Loubet of France, but the Costa Rican govern-

MEMBERS OF PRESIDENT PORRAS' CABINET.

DON GUILLERMO ANDREVE, Secretary of Public Instruction

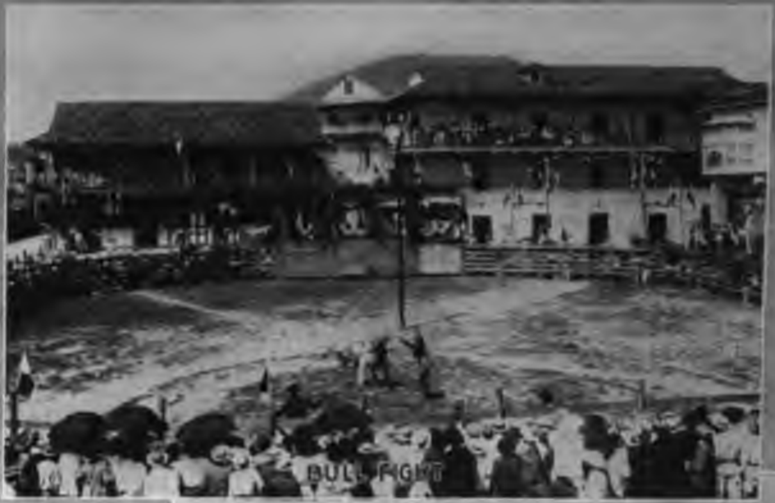
DON RAMON F. ACEVEDO, Secretary of Public Works.

DON ERNESTO T. LEFEVRE, Secretary of Foreign Relations.

ment refused to abide by his decision, which, for the most part, sustained Panama's contentions, and the matter is now before another tribunal. A tripartite treaty was arranged by the United States in 1912, to be signed by it, Panama, and Colombia. The proposed convention defined the boundaries and gave Colombia a sum of money—conscience money, it has been called by some. Colombia rejected the terms, and negotiations have since been begun all over again with some prospects of success.

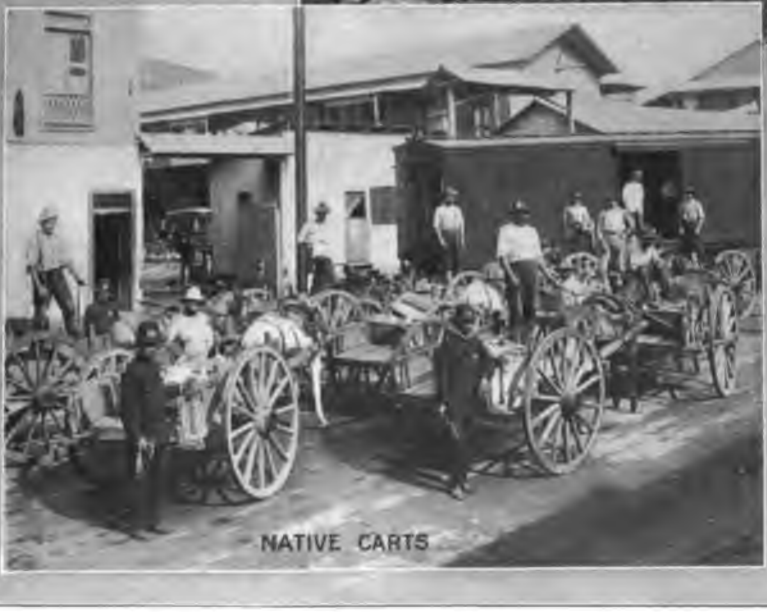
The republic, while less than one-eighth the size of the state of Texas, has room for ten Montenegros. The total land frontier will not exceed 350 miles, while the coast line on both oceans aggregates 1,245 miles. Its greatest length east and west is about 430 miles. The country is bisected with hills and valleys ramifying from a cordillera, or backbone, running irregularly throughout its length, ascending in some places to peaks of considerable height, and descending in others to comparatively low elevations like the pass at Culebra. Toward the sea on either side, the slopes end in wide, alluvial plains created by successive deposits of silt brought down by the rivers. Chiriqui volcano is the highest peak in the republic, 11,500 feet, which, according to Mr. D. F. MacDonald, geologist of the Canal Commission, has been extinct for 175,000 years. Both coasts are girt with islands and indented by numerous bays. The islands number over 1,700, Coiba, off the south coast, being the largest. The Bay of Panama constitutes the largest embayment, extending from Cape Garachine on the east to Cape Malo on the west, a distance of 100 miles in a direct line. Over 150 streams empty into the Caribbean Sea, and 300 into the Pacific Ocean. The largest is the Tuyra in the Darien region; the Santa Maria, empty-

The President's Residence, Panama City.



BULL FIGHT

ROAD BUILDING



NATIVE CARTS

Bull fights are now prohibited, but cock fights are still a popular sport. Much money has been and is being spent in the building of fine macadamized roads. The street traffic in Panama City is largely carried on by means of two-wheeled carts drawn by one of the small native horses or mules. In this particular scene Panamanian silver money is being carted to the car to pay off laborers.

ing into Parita Bay, is believed to be second in size, with the Chagres River, feeder of Gatun Lake, third.

The republic is divided into seven provinces, namely, Bocas del Toro, Chiriqui, Cocle, Colon, Los Santos, Panama, and Veraguas. Panama province is much the largest embracing that region as yet unreclaimed from the Indian tribes, known as the Darien. Panama City is the federal as well as provincial capital. After the sack of Old Panama by Morgan, the survivors moved to the site of the present city, five miles to the west, its founding dating from January 21, 1673. In 1904, when the Americans came, the city had a little over 20,000 inhabitants; the government census of 1911 gave it 37,505, and in 1913, it was estimated to have 50,000. Colon, the second city in size, situated on Manzanillo Island, was a miserable village of 4,000 souls in 1904, built over a bog, but has since grown to an enterprising well-ordered town of 25,000 or more, a gain of over 600 per cent in the past ten years. Panama City today enjoys most of the conveniences of any city of its size, including taxicabs and an electric street railway, which were placed in service in August, 1913. Colon, also, has a tramway under construction. The future appears bright for these two cities, owing to their proximity to the Canal termini. David, the capital of Chiriqui province, is the third largest city, while Bocas del Toro, built up by the banana interests of the United Fruit Company, ranks fourth.

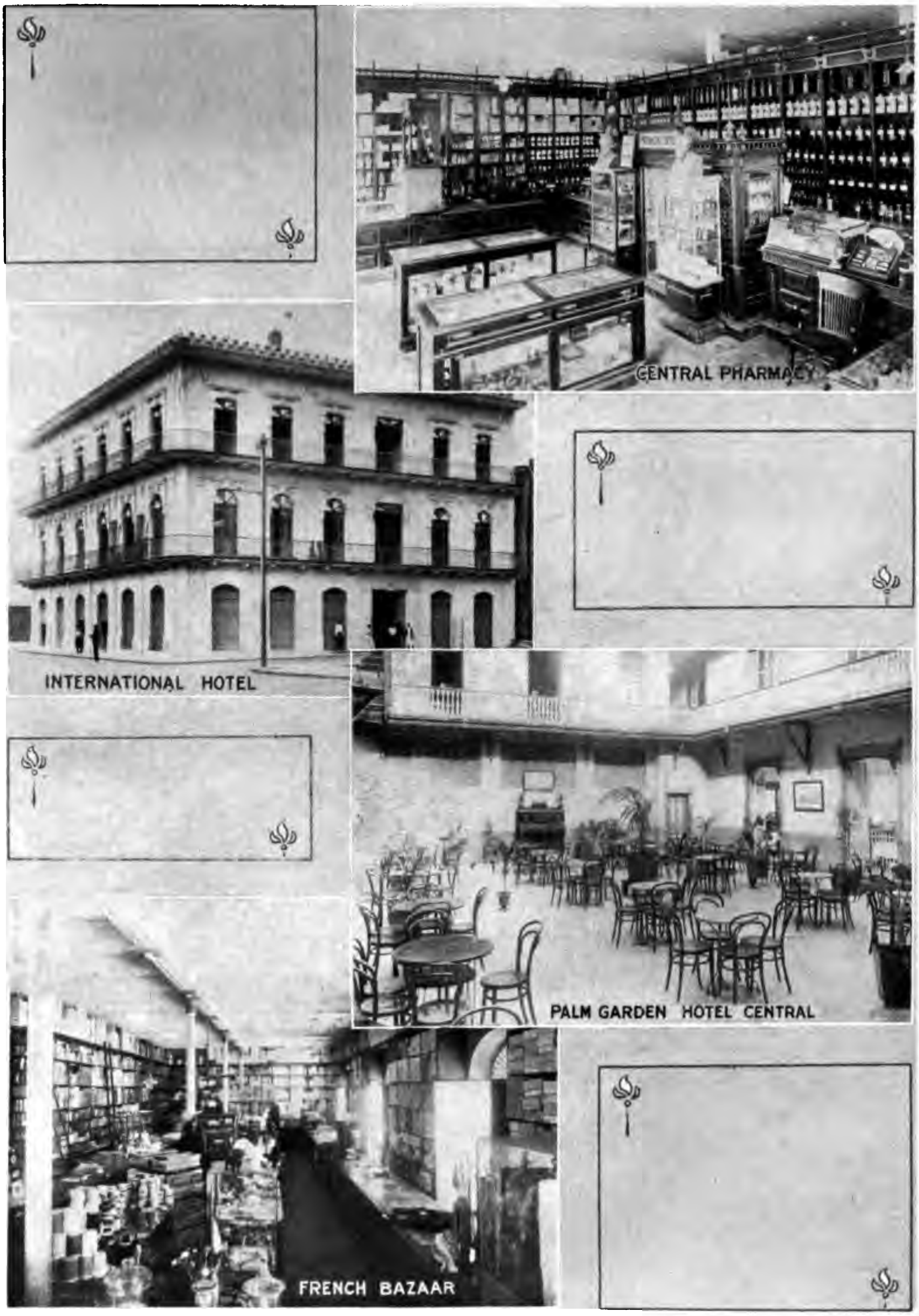
Plaza de la Independencia, or Central Park, Panama City. The public parks are the favorite meeting places of the masses. Band concerts are held every Sunday and Thursday evenings. The natives assemble in their gala clothes, together with a cosmopolitan mixture of races.

GOVERNMENT IS PROGRESSIVE

The present administration is headed by Dr. Belisario Porras, a leader of the Liberals, who took a prominent part in the revolution of 1900, and who is a thorough progressive. He was inaugurated on October 1, 1912, after an exceedingly hard fought campaign, and is called Panama's first constitutional president. In view of possible attempts at fraud, the United States was called upon to supervise the election, and did so. In his pre-election speeches, Dr. Porras promised the people of the country certain reforms, and many of these reforms are being brought about. When he took office, the national treasury was empty, and a considerable amount was owing to the local banks on loans. In less than six months all debts were paid, and, in August, 1913, there was a balance in the treasury of over $350,000, not including the first of the annual payments of $250,000 made by the United States in 1913, under the Treaty.

The national constitution, providing for a centralized republican form of government, went into effect on February 24, 1904. The president is elected by popular vote, for a term of four years, and cannot succeed himself. The elections are held in July, and the successful candidate takes the oath of office on the first of October, following. He receives a salary of $9,000 per annum, with an allowance for household expenses and extra official purposes. He appoints all the higher officials, including members of his cabinet, judges of the Supreme Court, diplomatic and consular representatives, and the governors of provinces. He is assisted in his duties by a cabinet of five members, consisting of a secretary of finance, secretary of foreign relations, secretary of government and justice, secretary of public instruction, and secretary of public works. In case of death, the duties of the president devolve on the *Primer Designado*. There are three of these *designados*, which correspond to the titles of first, second, and third vice-president, respectively. The lawmaking branch of the government is a

Panama City as it appears from Ancon Hill. This is the capital of the Republic of Panama and is situated close to the Pacific entrance to the Canal. It has about 40,000 inhabitants, including almost every nationality on the globe.



While Panama City as a whole, has quite an antiquated appearance, there are a number of up-to-date stores which import the latest creations, direct from Paris. The Palm Garden in the Hotel Central is a popular meeting place, especially on Sunday evenings after the band concert in the park.

single body known as the national assembly, consisting of deputies elected for a term of two years in much the same manner as United States Congressmen. The administration of justice is vested in a superior court, circuit courts, district courts, and such inferior tribunals as may be established by law. The superior holds court in Panama City, and consists of five judges. In a general way, foreigners enjoy the same rights and privileges before the tribunals of the country as citizens do.

REVENUES

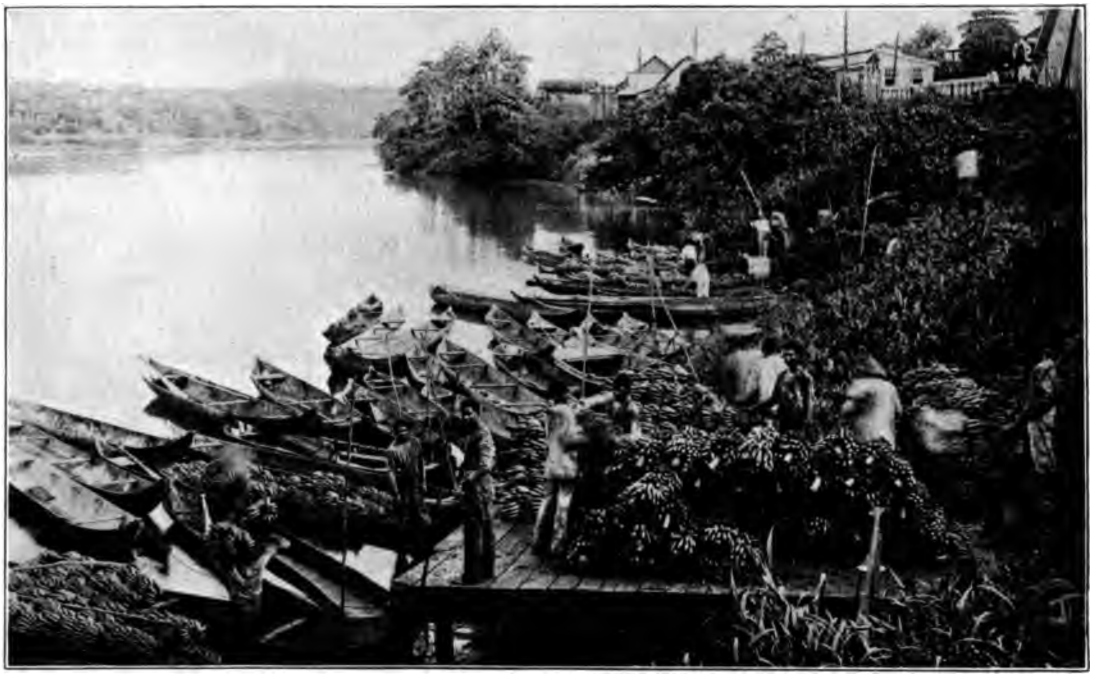
The national finances are in an excellent condition. The sum of $6,000,000, the balance of the $10,000,000 paid Panama by the United States for the canal strip, is loaned on first-class New York mortgages, drawing 4½ per cent interest annually. This interest, about $272,000, together with the following approximate amounts, form the fixed annual revenues of the republic: Canal Zone rental, $250,000; interest on the sum to guarantee the parity of money, $9,000; interest from funds in the National Bank of the Republic, $33,750; rents of public market and dock, $40,000; rents from lots in Colon, $26,000; interest on bonds of the National Navigation Company, $2,450. Total, $633,200. Added to this are the customs duties and consular fees, estimated at $4,189,986 for 1913; and internal revenue collections estimated at $500,000. The budget of expenses for 1913 is estimated at $3,841,214. The country has no national debt, and there is no probability of its ever having one. All imports into the republic, with the exception of certain articles on which a higher tax is imposed, are subject to a duty of 15 per cent. Liquors of all kinds, matches, salt, cigars, cigarettes, and tobacco, coffee, etc., are subject to a special tax. The

Panama Bay at high tide. A part of Panama City and Ancon Hill in the background.

importation of opium is now prohibited by law. Foreign patents and trade marks may be registered upon application to the Secretary of Public Works (Fomento), and the payment of the required fee.

NATIONAL CURRENCY

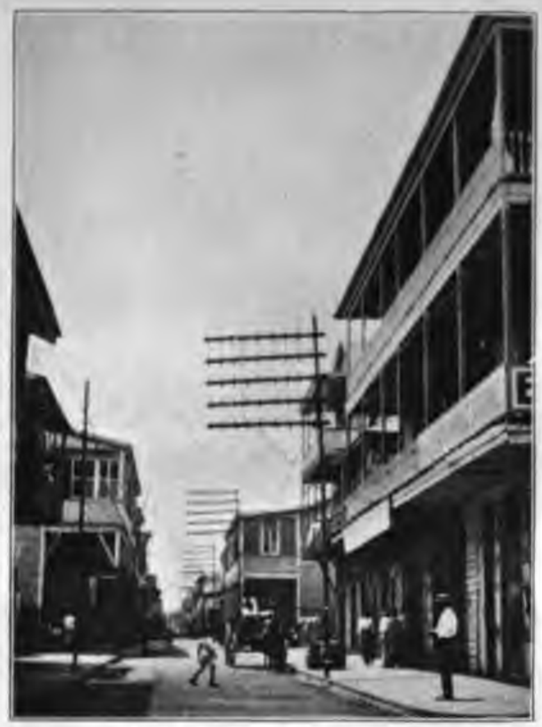
The monetary unit is the Balboa, having a fixed value of one dollar in gold. Under the Treaty Panama agreed to maintain its coinage at a parity of 2 to 1, and accordingly there have been minted silver coins in 50-cent, 25-cent, 10-cent, and 5-cent denominations, and nickel coins in 2½-cent and ½-cent denominations, known as *peso*, *medio peso*, *dos reales*, *real*, *medio*, and *cuartillo*, respectively. In 1904, Colombian silver currency was the only medium of exchange, with the exception of a small amount of American currency then in circulation. The Colombian money was retired when the new coinage was issued. The local currency would long ago have proved inadequate for the growing commercial transactions of the country had it not been for the enormous amount of American money in circulation. American gold figures exclusively in all large business deals, and American subsidiary coins down to the copper cent pass current everywhere side by side with the Panamanian coins. The National Assembly of 1913 authorized the establishment of a national bank, with power to issue paper money, but constitutional objection has been made to the plan.



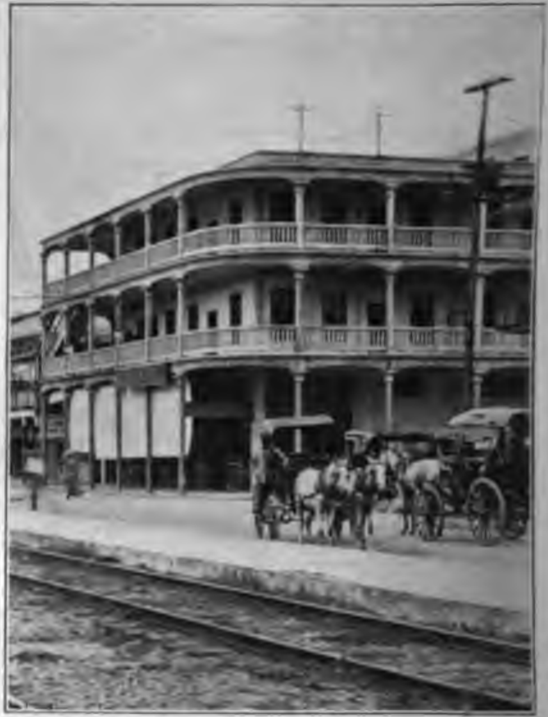
Cayucos or small boats, shown in the picture, are hollowed out of a single log, and are used on the interior rivers to bring down bananas and other fruits; they are either poled or paddled from the stern.

PUBLIC IMPROVEMENTS

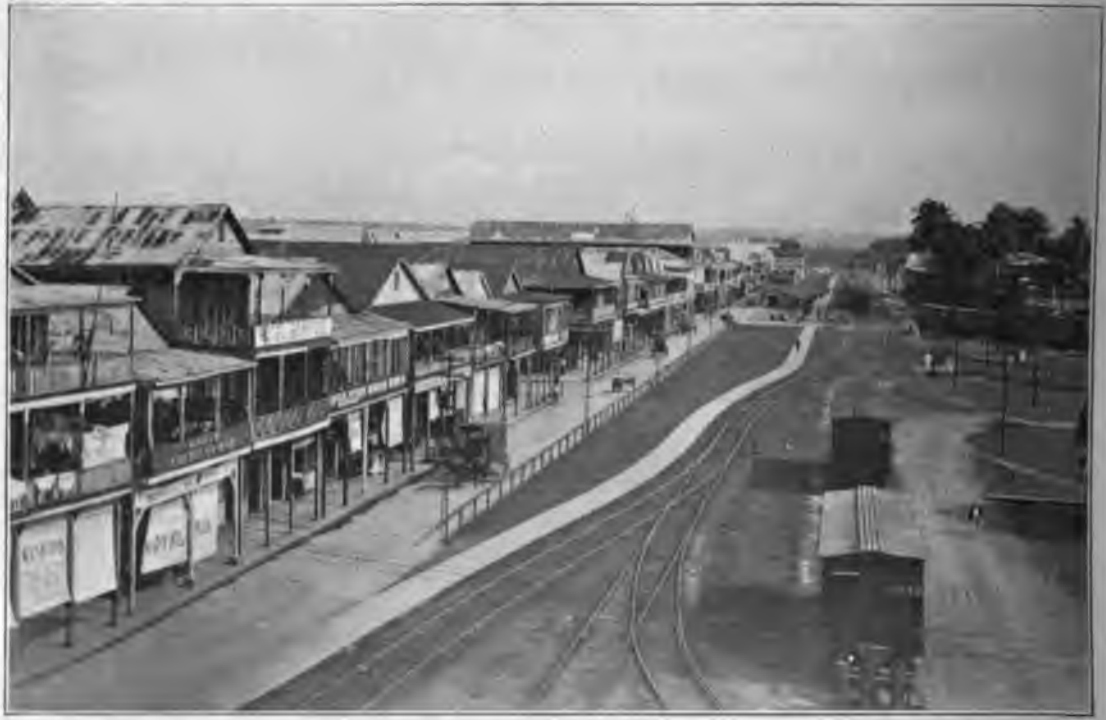
Early in 1904, the sum of $1,625,000 was set aside for public improvements, and since that time several millions more have been spent. When



Some of the streets in Colon have queer names. This is a scene in Bottle Alley, one of the principal business thoroughfares.



One of the newer type of concrete buildings. This structure is the property of the Panama Railroad, which owns most of the land in Colon.

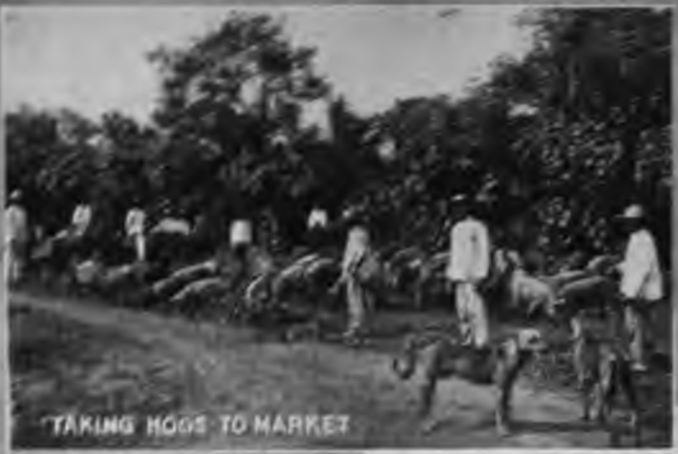


Front Street, Colon, as it appears to-day. Before the Americans started work on the Canal, many of the streets were in an unsightly and consequently unhealthy condition. In the past few years a large amount of street improvements have been made and much land has been filled in and reclaimed east of the city. All of the streets, both residential and business, are now macadamized.

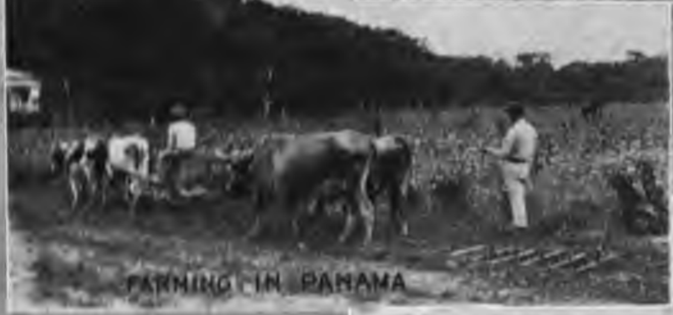
Panama became a republic there was not a road in the country that could be dignified by that name. Subsequently, a number of roads and bridges were built, connecting the principal towns in western Panama, but the work, in many cases, was let to irresponsible contractors, and proved defective. It is officially admitted that the main trouble has been the failure to adopt a definite plan. This mistake has been corrected, and works of a public nature are now carried out along uniform lines. The largest wagon bridge in the republic is that over the Santa Maria River on the border of Cocle and Los Santos provinces. It was built in 1907, under the supervision of Mr. J. G. Holcombe, at that time chief engineer of the republic, but who was formerly in charge of all municipal engineering of the Canal Commission. Since 1904, municipal buildings, including schoolhouses, have been erected in all of the important towns. In Panama, a national palace and theatre was completed in 1908 at a cost of about $1,000,000; a city hall was erected in 1910; a national institute for boys, covering half an acre, was finished in 1911 at a cost of about $800,000; a spacious city market is now under construction, and plans have been prepared for an abattoir and cold storage plant to cost $100,000. In Colon, a government building was erected in 1906.

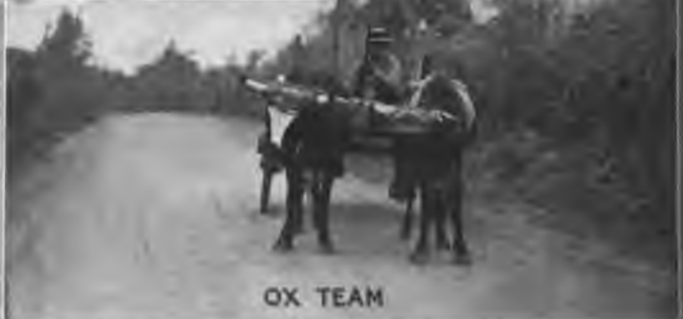
A busy scene at the playa, or market beach, Panama City, where small coasting vessels laden with vegetables and fruit unload their cargoes.

Development of the country has been greatly handicapped by the lack of suitable transportation facilities from the interior districts to the ports. Produce is brought to the ports by pack-pony, or by two-wheeled ox carts, over roads which, in the rainy season, oftentimes become impassable. It is then shipped to market by steamer or sailing vessel. On the Pacific coast, the National Navigation Company operates steamers west as far as Pedregal, the port of Chiriqui province, touching at all intermediate ports, and on the east to San


TAKING HOGS TO MARKET

TOBACCO PLANTATION


FARMING IN PANAMA


OX TEAM

Ancient methods of agriculture are still in vogue, such as planting corn by punching holes in the ground with a sharp pointed stick, although a few farmers have made homes and laid out plantations in the interior provinces and the methods of farming are being gradually improved. Produce is brought to market by a pack-pony or by two-wheeled ox carts over roads, which, in the rainy season, often become impassable.

Greetings from Panama

Miguel Bay. The Panama Steamship Company competes in this trade between Panama and Chiriqui, as do hundreds of small sailing vessels. On the Atlantic coast the traffic has to depend entirely on sailing vessels and launches.

There is less than 100 miles of railroad in the country, and is confined to the Panama railroad main line, and its branches, and to a line about 40 miles in length operated by the United Fruit Company in connection with its banana plantations in the province of Bocas del Toro. In 1910, at the request of the Panama Government, a survey was made by the Panama Railroad Company, for a line from Panama to David in Chiriqui province, a distance of about 274 miles. Several attempts to enact railroad legislation in the National Assembly, in order to proceed with the construction of this line, failed; it passed the Assembly at one time, but was vetoed by a former president on constitutional grounds. The present administration has abandoned this project, and is making a study of a series of short electric roads, with a view of connecting up

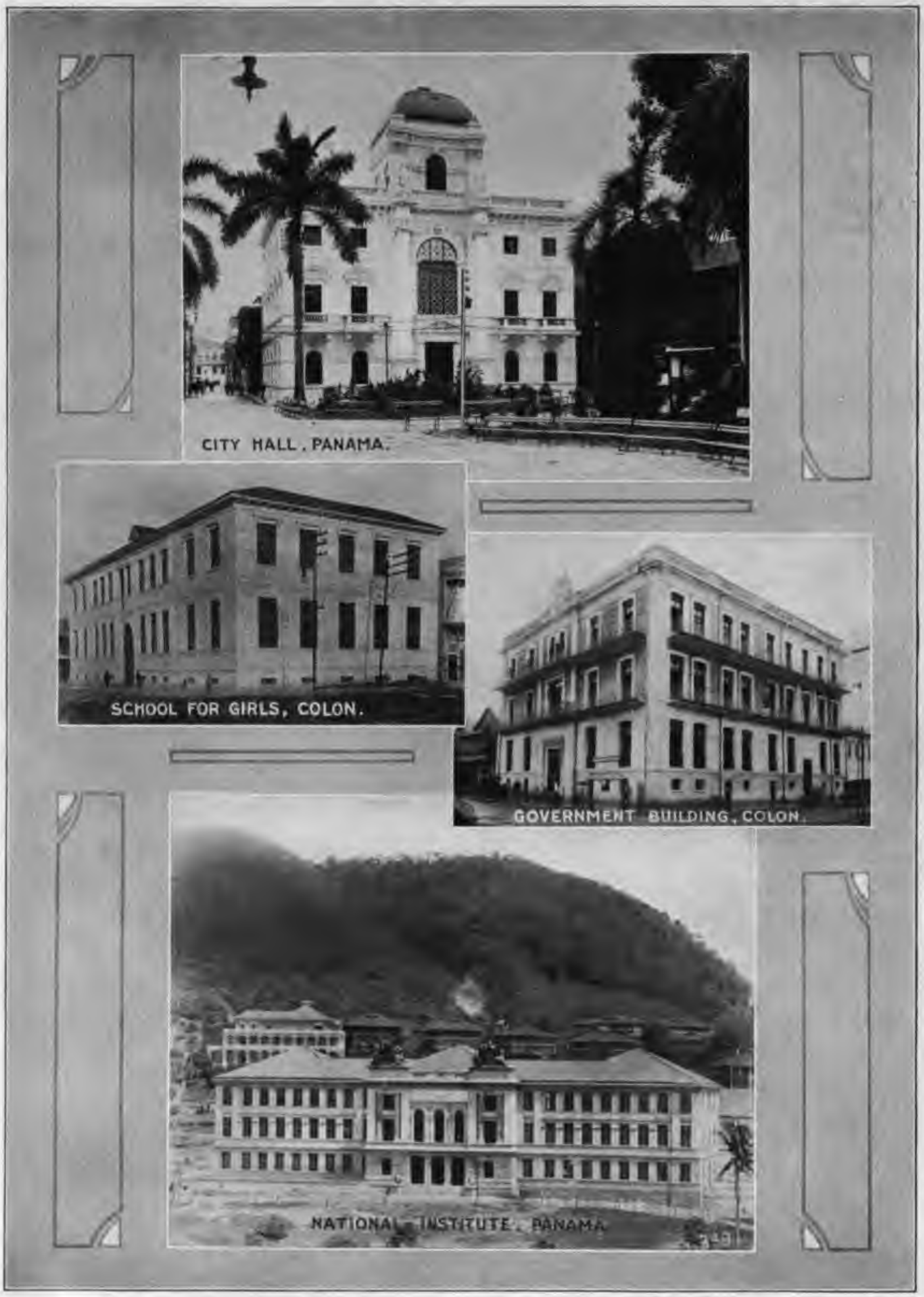
Celebration of the opening of the Panama tramways. Picture taken at the company's car barn.

the principal ports on the Pacific coast, west of Panama, with the interior districts, using the abundant waterpower for operating them. A number of other railroad schemes have been launched during the past few years, notably, one in the Darien by a German syndicate, and another in Colon province, having its port terminus at the mouth of the Chagres River; the former project was abandoned, and the latter has been held up by the United States Government. The Panamanian telegraph system is government-owned. A line extends from Panama to David, with branch lines ramifying through the provinces.

A corner on Central Avenue, Panama, showing a car of the tramway service.

FREE PUBLIC SCHOOL SYSTEM

The national constitution established a free public school system, something unique in Latin-America, and the government has pursued the policy of always providing liberally for the cause of education. Attendance at the public schools is compulsory, and absence without permission is punishable by small fines. Separate graded schools for each sex are maintained. The curriculum embraces studies that will prepare the pupil for the local normal schools, and the institute. It includes drawing, and in the case of the girls, instruction in needlework. Lessons in English are given in all the city schools, and some of the country schools, twice a week. The government also maintains a manual training school for boys, and a natural conservatory of music to which children of poor families are given free instruction, and where boys are trained to qualify for employment in the national band. There are a number of private colleges for both sexes in the republic; the colleges for boys are generally conducted by the Christian Brothers. The institute is open to Panamanian boys free of charge, but only two in a family are entitled to be admitted at the same time on this basis. The director is an American, but the talent of various countries is



CITY HALL, PANAMA.

SCHOOL FOR GIRLS, COLON.

GOVERNMENT BUILDING, COLON.

NATIONAL INSTITUTE, PANAMA.

The splendid public buildings, worthy of any towns of their size, which have been erected in Panama City and Colon, are real monuments to Panamanian progress. The Panama government provides liberally for the education of its youth. The National Institute, Panama City, cost about $700,000 and has class room for 1,000 boys. Colon also has a school building for boys of much the same architectural type as the one shown in the picture for girls.

drawn on freely in the selection of the remainder of the faculty. The scholars are classed as *internos*, those who board and room at the school, and *externos*, those who live at home. Every pupil who lives at the school must be provided prior to admittance with clothes and bed linen to the value of $100.

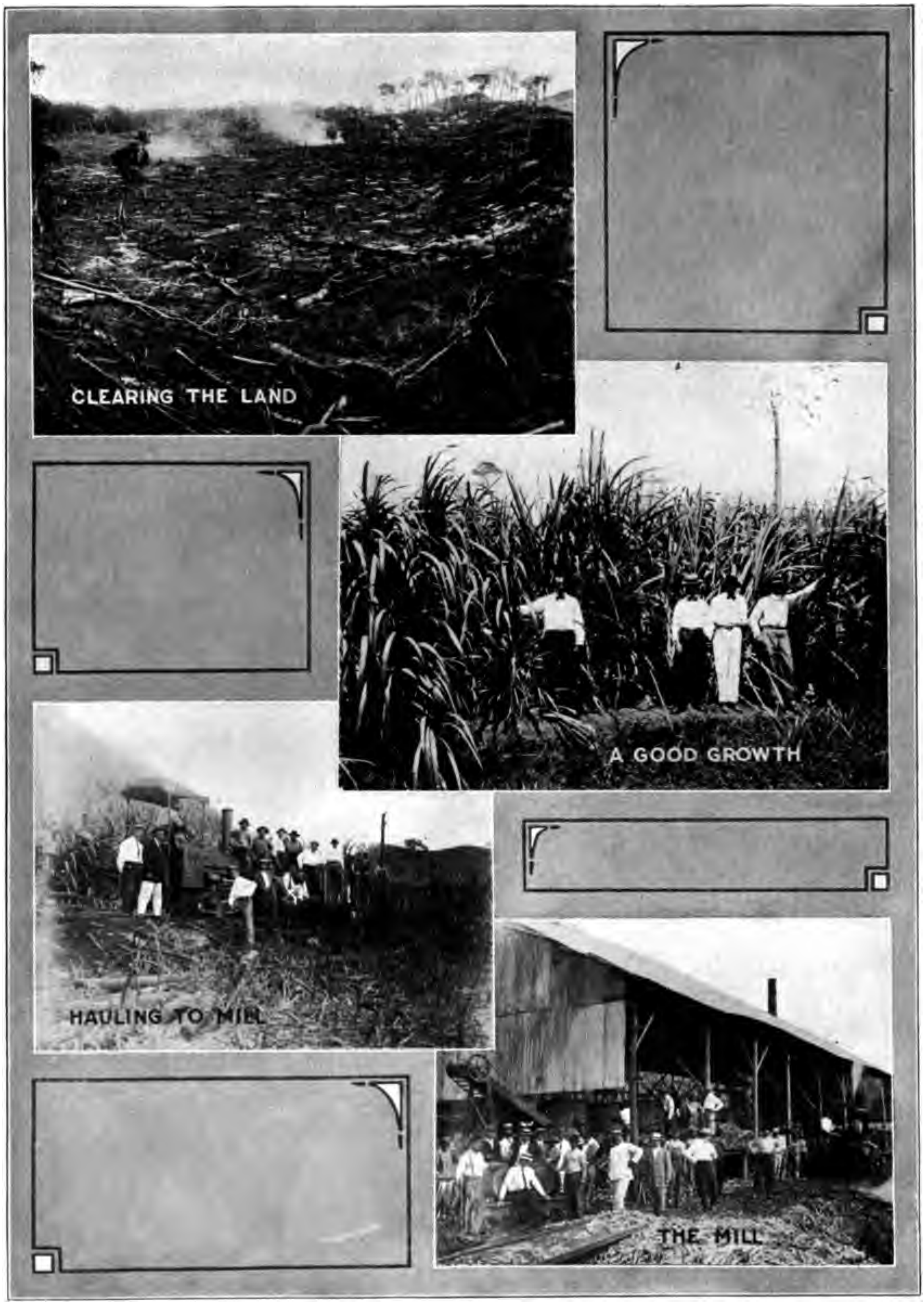
On May 1, 1913, the number of public schools in each province, number of teachers employed, and scholars enrolled, were, as follows:

PROVINCE	No. of Schools		Mixed and Alternates*	No. of Teachers		No. Pupils enrolled	No. Receiving Instruction, one-half day
	Boys	Girls		Male	Female		
Bocas del Toro	2	3	9	5	12	291	217
Cocle	11	9	35	18	53	2,352	1,682
Colon	10	12	12	22	45	2,224	1,358
Chiriqui	22	22	44	36	76	4,111	2,307
Los Santos	20	20	42	12	34	2,942	2,016
Panama	29	30	11	76	174	6,407	5,177
Veraguas	13	8	12	20	25	1,214	861
Totals	107	104	165	189	419	19,541	13,618

* Mixed schools are those where pupils of both sexes attend classes at the same time. Alternate schools are those where the boys attend school in the morning, and girls in the afternoon, *vice versa*.

In addition to the above, there is a normal institute for girls, with 161 pupils, and 19 professors; national conservatory of music and declamation, with 176 pupils and eight professors; school of arts and sciences with 136 scholars and nine professors, and the National Institute for boys with 157 pupils, and 26 professors, all located in Panama City. Since May 1, several other primary schools have been opened, and one professional school for girls. The national

Masonic Temple, Port Limon.



Views of a Sugar Cane Plantation, located about seven miles east of Colon. The raising of sugar cane is destined to become one of the future permanent sources of wealth of the country. The Isthmian cane contains a high per cent of saccharine and grows readily.

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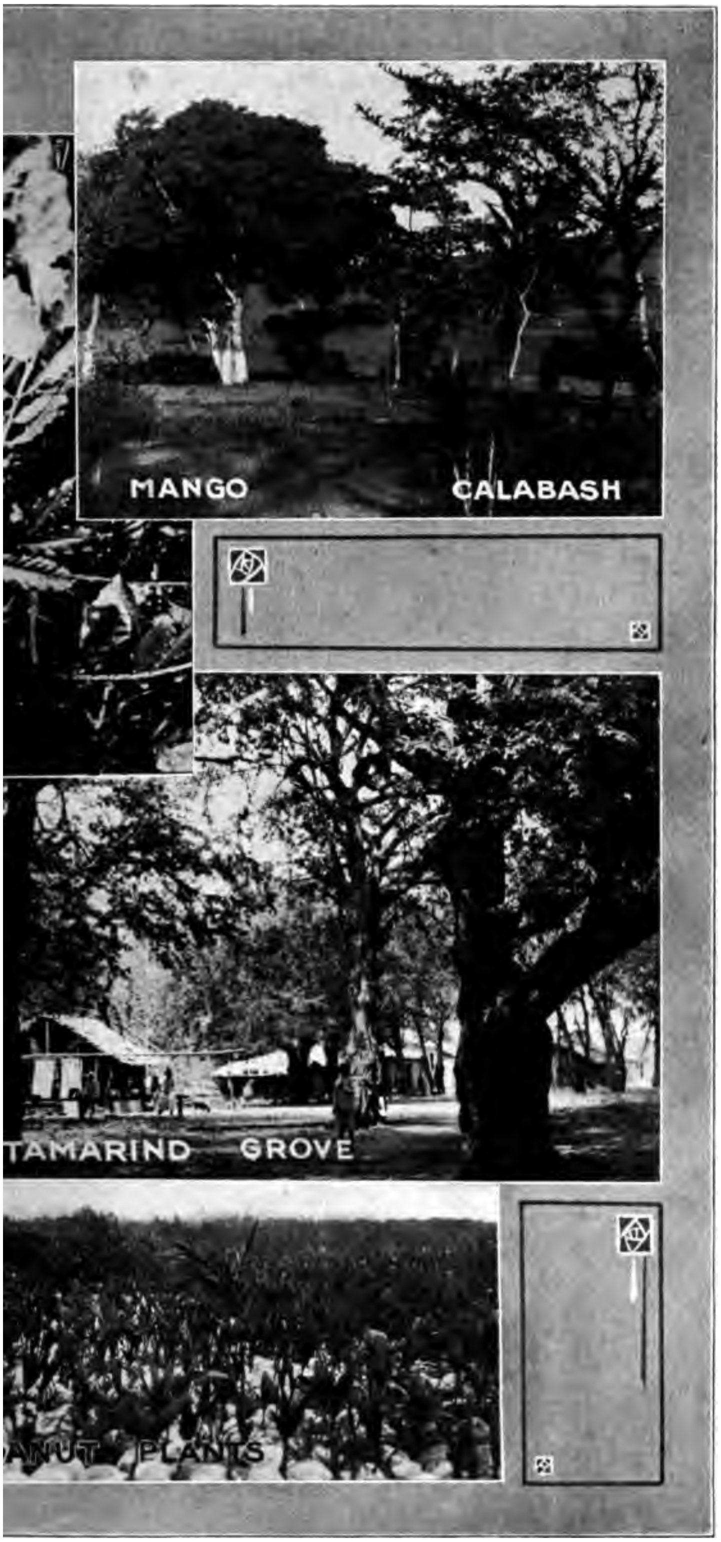

ıon of the fruit bearing trees in Panama. Gourds, from the gourd
or household utensils. An excellent grade of coffee is grown on
ıll pod-shaped fruit with an acid flavor, having medicinal proper-
and sprout on the surface of sandy soil, and the growing of
le industry.

Panamanian
conflagrations,
J. G. Duque is
his personal fun

Automob

Both Panama and Colon in times past have been visited by terrible
ew years ago were compelled to fight fires with antiquated equipment.
el of the Panama department, and for years paid for its upkeep out of

of the Panamanian fire department at Colon. The city of Panama
provided with one of these modern machines.

An iguana, or
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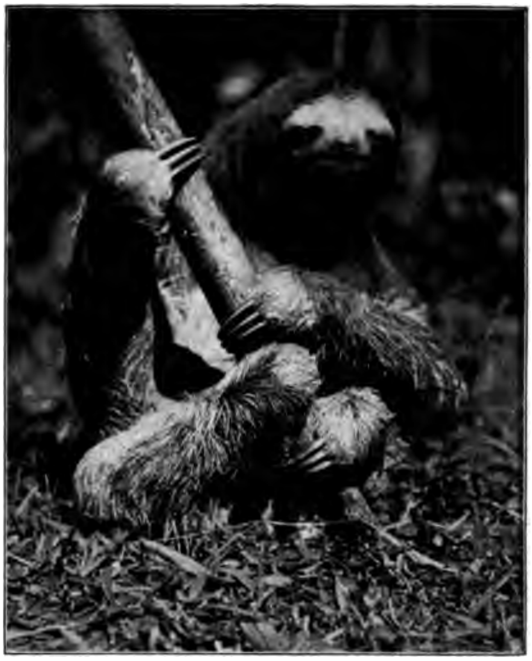
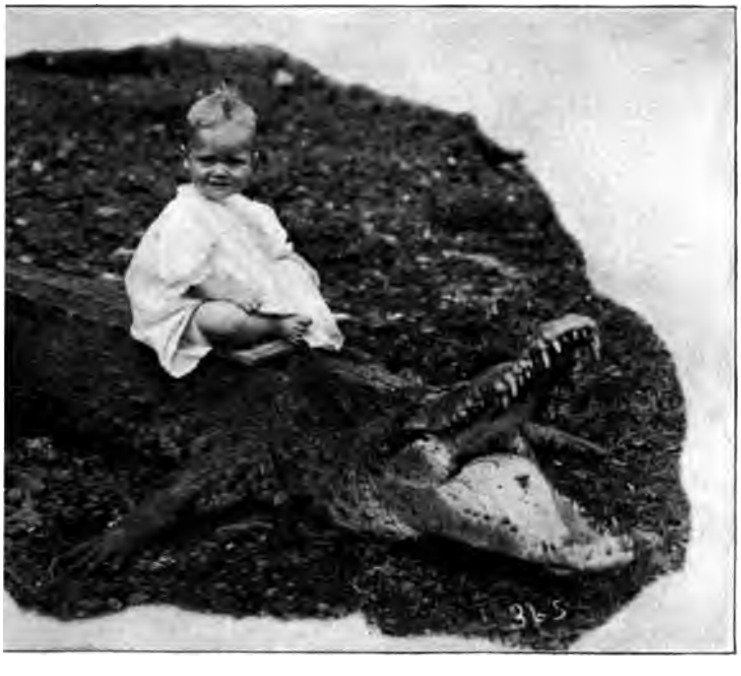


Among the wild animals on the Isthmus, none are more unprepossessing than the sloth, shown in the picture. They are harmless and stick close to the trees.



nus. The picture above shows "Buster" Brown seated on a 15 ft.
three miles from Porto Bello, in August, 1909. The rivers of
ands of alligators. The Bayano river is especially adapted to their
mployes often make trips up this river and enjoy the sport of

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of export from the Isthmus is bananas. The annual shipment of the
its plantation in Bocas del Toro Province alone amounting to up-
It is the second largest banana producing district in the world.

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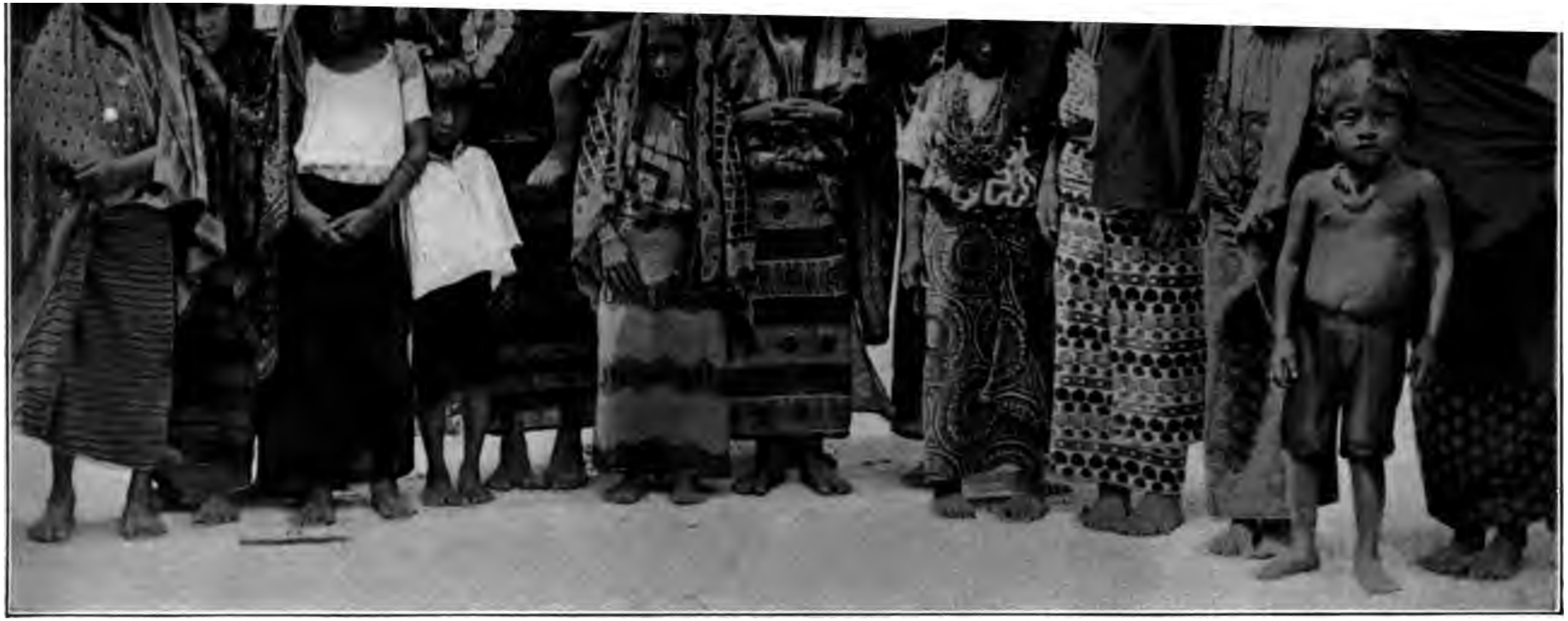
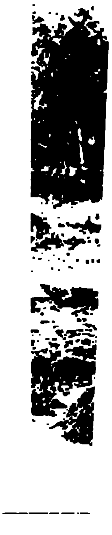


Among the several tribes of Indians in the Republic of Panama, the San Blas or Cuna-Cunas, who inhabit the hundreds of islands and islets that fringe the Caribbean coast, are the most conspicuous. They are a small statured people, fond of ornaments and bright-hued raiment. They subsist on vegetables and fish, and, until recently, it has been a tribal law that no stranger should be permitted to remain after nightfall.



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MAKING MOLASSES

STRAW FOR HATS

RICE

d in making molasses in the interior of Panama and the produce ture of native rum. Pineapple growing is quite an industry and les in the world are grown on Taboga Island. A sample of the : Panama hats is shown in one of the above pictures. A family ıe evening meal by hulling rice with mortar and pestle, after the ıtensils of the people of the interior of Panama are crude affairs.

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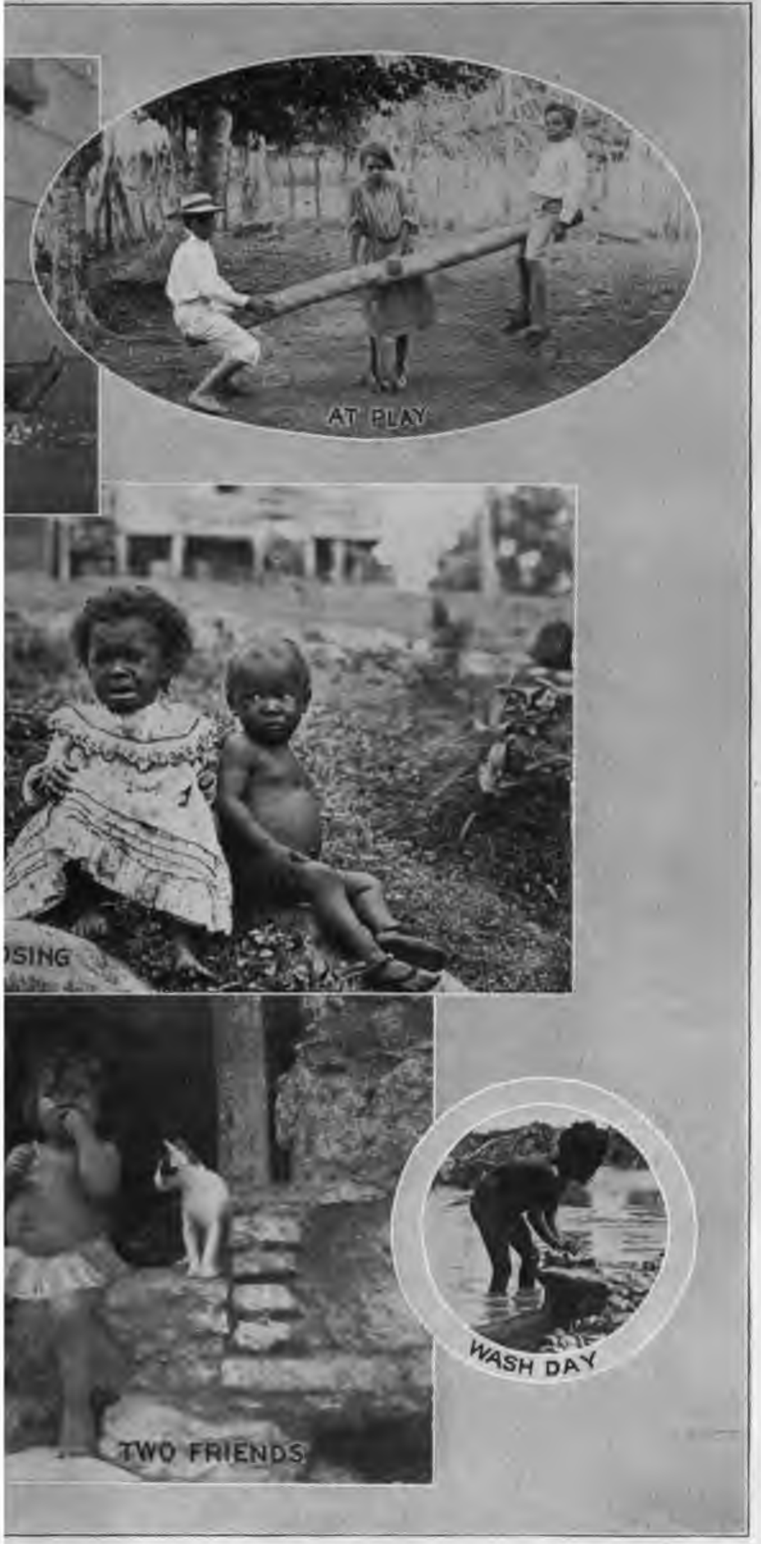

AT PLAY

OSING

TWO FRIENDS

WASH DAY

al zone love to play as ardently as do those in the cooler climes;
ys and sorrows and look forward with some desire to the time
One of their games peculiar to the Isthmus resembles "shooting
eeds of the maranon, a native fruit.

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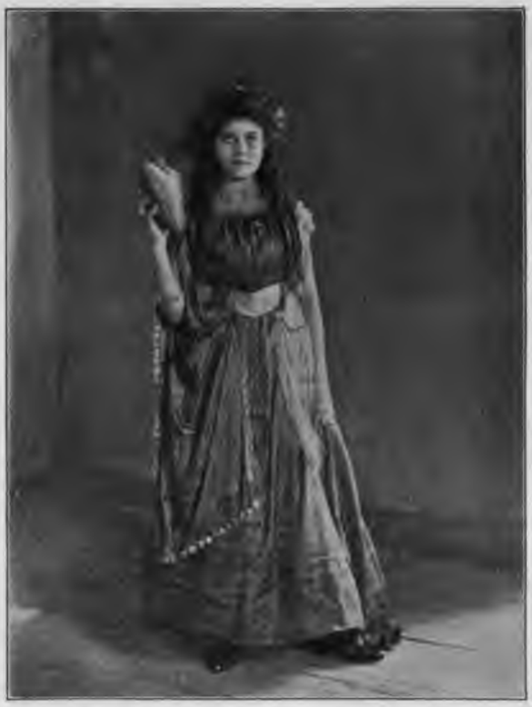

One of the belles of Panama, or a Panamanian "Queen of Hearts."

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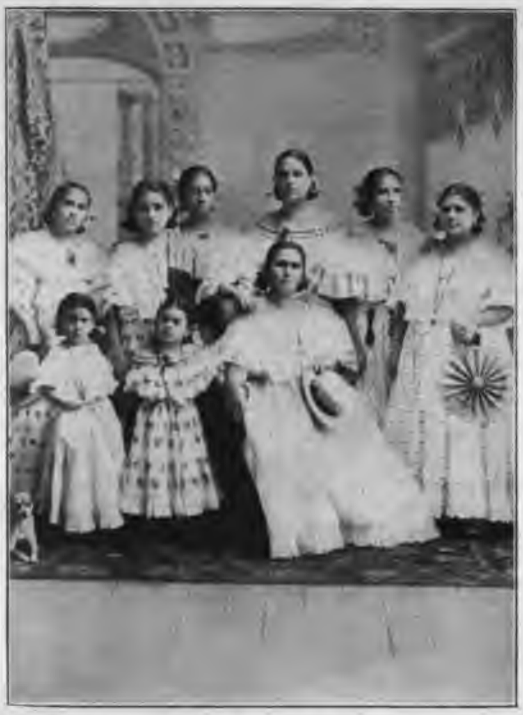

A Panamanian family. Girls of the higher class Panamanian families are not allowed on the street after nightfall, without being accompanied by some member of their family.

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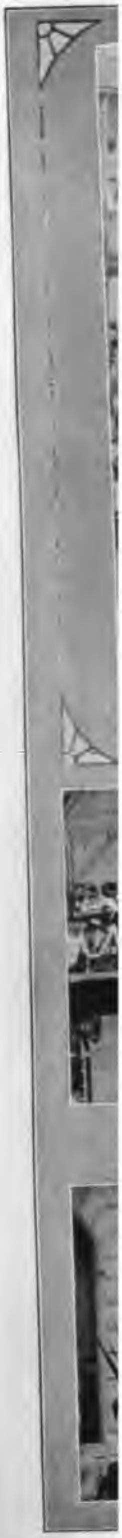
The village church at San Miguel, Pearl Islands. These islands are located in Panama Bay and are noted for their pearl beds.

ıbode possesses. This, on feast days, usually consists of ly called the national costume, which is worn with a grace ement, which no woman not native born has been able to ; bedecked with varicolored butterfly and flower ornaments, ;ht colored slippers adorn the feet. No hose are worn. A .y scarf generally completes the attire. The *pollera* is not r classes, but is much affected on religious festivals by the)f the rich. The costume is very carefully made frequently $50.

ıtially a Catholic country, and while all of its civilized he forms of religion, there is surprisingly small interest in The rites of baptism and christening, however, are never

l College, built by the h English and Spanish The Sunday morning in English and the ish.

Christ Church, Colon. The oldest Protestant church on the Isthmus, built in 1865 by the Panama Railroad. It was consecrated by Bishop Potter and is now owned by the Episcopal Church.



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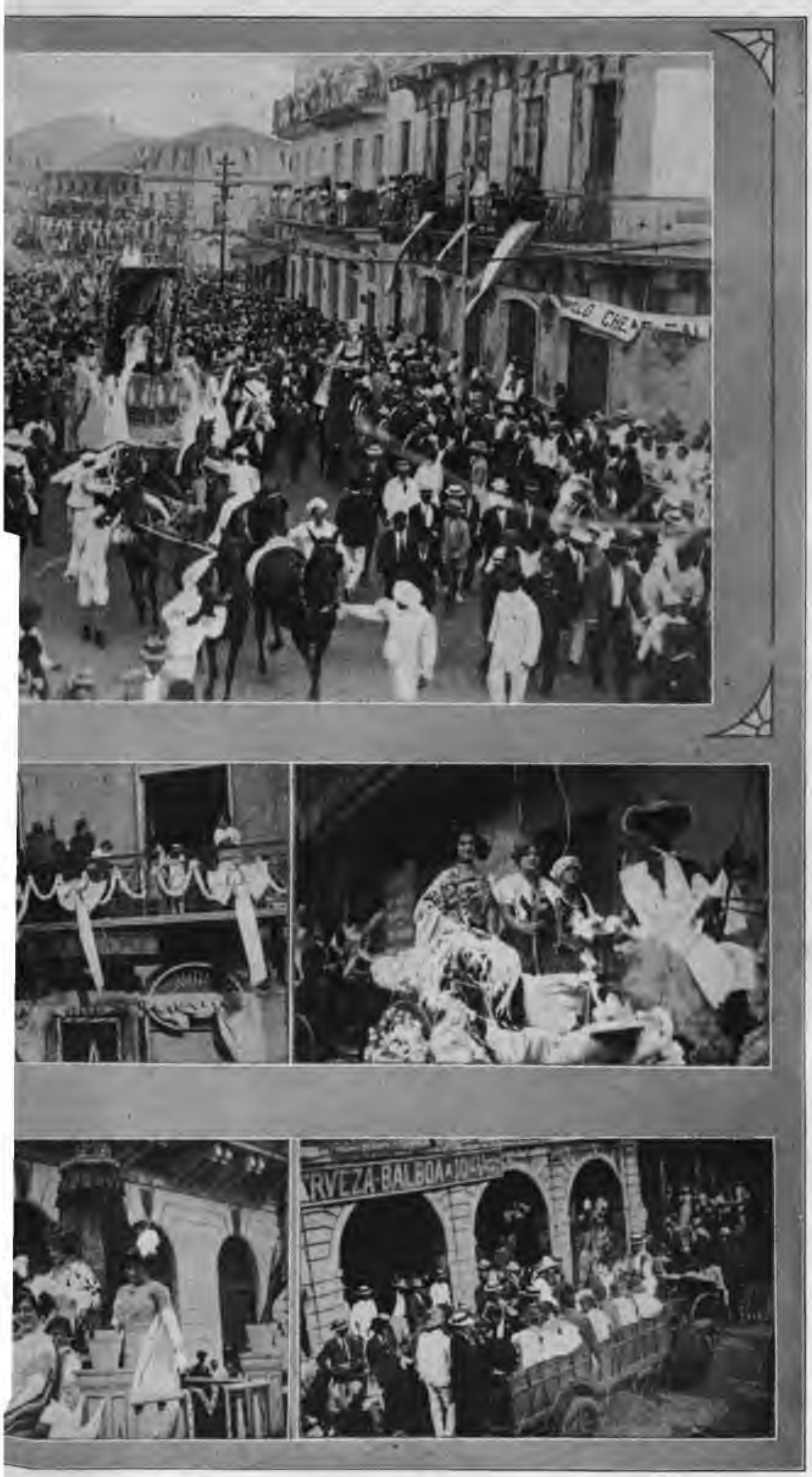

ama City. The Annual "Carnival" or Mardi Gras, is the biggest event of he upper picture shows the Queen of the Carnival riding in her royal t of the festivities. Tons of confetti are thrown and everybody takes a

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Peculiar

aque, a hunter, and between the two there is usually deadly ucunaques are typical savages, while the San Blas, although ing of the white man, does not detest him, and has adopted e man's comforts.

es of the Cuna-Cuna and the Chucunaque have long been ook to the outsider, and until recently it has been a tribal Blas that no stranger should be permitted to remain after s said, out of fear for their women. The San Blas inhabit the ds and islets that fringe the Caribbean coast, and subsist on h; fresh meat is rarely seen in their villages. Before Panama Colombia, the San Blas were ruled by one chieftain named e latter died of fever while on a mission to Bogota, the capital l was succeeded by his nephew, Inapaquina. Owing to the ness in recognizing the change in governments, Panama rity over the San Blas to another Indian, whose English Robinson. Some of the San Blas refused to accept Robinson, ed, so today the tribe is divided. Robinson, who spent several ed States, is a progressive, while Inapaquina has no desire to te man's acquaintance. The capital of the former is at San , near the mouth of the Rio Diablo, and there, early in 1913, e, a woman missionary succeeded in establishing a mission ope made an attempt to enter the country several years t time was not permitted to land. She persisted in her efforts, influence of Chief Robinson, she was successful; now the she came. Few of the San Blas are able to count above 10,

tion seen at San Juan
ueni River.

Scene on the upper Chagres River. The river between Alhajuela and El Vigia flows between high rock banks.

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:he Canal Commission received a rebuff at their hands a few
s when a hunt was being made for a good quality of sand to be
:ete for Gatun Locks. A tug was sent along the San Blas
ın attempt was made to investigate the sand on the shores of
:he officials were requested to desist, which they did. The
eir mountain neighbors in dread, because in times past the
omed to levy tribute on them, and in case of non-payment to
ir villages, destroying the houses and carrying away property.
dians have also occasionally resorted to poisoning the streams
n Blas procured their drinking water. The author has known

licemen lined up in front of the National Palace in Panama City, to form an escort at the funeral of a president.

ı whole village in anticipation of one of these raids. The
ent has only one post in the San Blas country at the present
o Obaldia.

THE GUAYMIES

Indians are partly civilized. The women copy the simple
r native women, and the men wear shirts and trousers. They
ng, and face painting is a common practice among both men
ier says: "The children, especially the little girls, frequently
vith a warm, brown velvety skin, and beautiful eyes. When
of puberty, their hair is cropped short, and is not allowed to
ıe first baby is born. Maidenhood, however, is a short stage
ıymi women, who, not infrequently become mothers before

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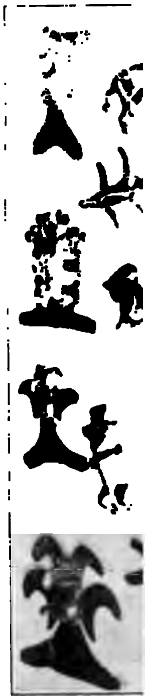

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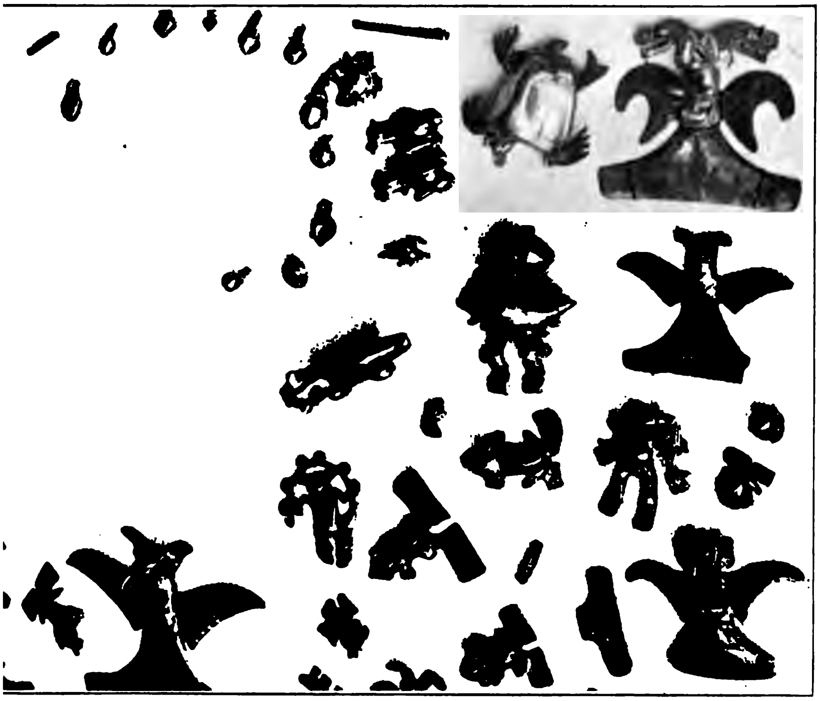
ly black. The people are cleanly and very industrious.
son, their life is wholly out-of-doors, planting their crops,
d canoeing. When the heavy rains come they remain at



ents found in the graves of an extinct race of Indians in the Province of
e made of solid gold and each is supposed to represent some animal.

ets of all kinds, a work in which the women are remarkably
pe and hammocks, carving dishes out of tree trunks, etc.

NCIENT CIVILIZATION OF CHIRIQUI

, a powerful and aggressive tribe sometimes spoken of as
ably an offshoot of the Mayas, inhabited the greater part
iriqui. As a people they are now totally extinct, but they
lences of a civilization that compares favorably with that
ico, the Mayas of Central America, the Chibchas of the
nd the Incas of Peru. In the latter part of 1858, natives
illage in Chiriqui province, about 15 miles from David,
ed a gold image. Further search led to the discovery,
acres, of gold ornaments and curious pottery valued at
was evidently a *huacal*, or burial ground for the ancient
ne other discoveries have been made, and thousands of
ve been explored. In many, pottery only has been found,
aving been placed solely in the graves of some chieftain,
the tribe. The graves are invariably enclosed in rough
a kind of a vault. Visitors to Chiriqui rarely return with-
ry, which can be obtained very cheaply, or if one cares to,

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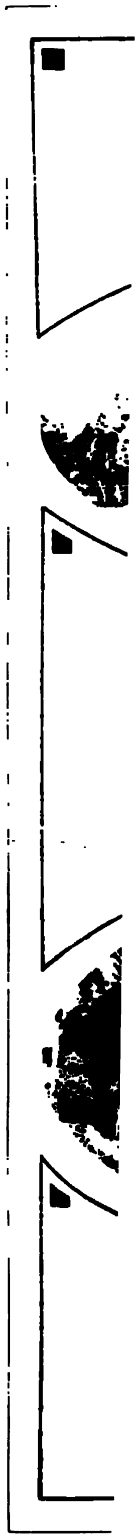
mself. The gold ornaments are of splendid workmanship, dians were skilled metal workers. They appear to have ulds, and the most favored forms are the frog, tortoise, , eagle, and snake. The pottery is vari-colored, either the decoration ranges from crude outlines of animal shapes ar geometrical designs. Some implements and household en found. In 1913, graves containing some of these gold rted to have been found in the province of Los Santos, of the graves of Chiriqui.

ama City. The wall is said to have cost $8,000,000 and is the one which ark that the work ought to be visible from his palace in Spain.

t that comes from Chiriqui province, and is also quite a, is the *cadena chata*, a long gold chain, made of thin gether. They are highly prized by the Panamenas, who ys, while the Americans have sought them so eagerly that y in price and caused numerous imitations. A genuine ow about $40, could have been bought in 1904 for half

adas (painted stones) found in Chiriqui province are he ancient Indian inhabitants. The largest specimen of pen plain a few miles out of David, and consists of a huge iety of hieroglyphics have been cut and painted. Smaller d in the valley of the Caldera River. Mr. D. F. Mac-n the geology of western Panama, says of them: "From



Las S
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MANUEL ESPINOSA B.

SANTA ISABEL

NATALIO EHRMAN

ımmer homes of many of the wealthier people of Panama. Many
ected in this suburb. It is tropical, because here is the sign-manual
ferns and other luxuriant growths. It is located about seven miles
:d by a good macadamized road.

THE L

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Crater of C

uable make of a Panama hat is the Montecristi, so named
cuador where they are made. This hat sells in the local
$50, and would be worth from $75 to $100 in the United
e Isthmus accustomed to the cheap imitations handled
ean importers are at a loss to account for the prices asked
All Panama hats look more or less alike to them, and
ie fact that in fabricating a Montecristi hat of the best
eral persons for a period of several months is required.
and labor on the piece-work plan. There are plenty of
dled on the Isthmus, and, since the coming of the tourists,
m has sprung up. The so-called "made under water"

CANAL ZONE SOUVENIR STONES

Canal, a number of varieties of stones, agates, moon-
ere found, that, when properly cut and polished, made
Some of the best of these specimens were uncovered
onitors were engaged in sluicing material from the Canal
s Locks, formerly the ancient bed of the Rio Grande.

THE PANAMA LOTTERY

ry has been in operation for many years, but until 1904 it
in roulette. The latter went out of existence by law on
hen the lottery at once came to the fore. The right to
al Zone came before the Supreme Court of the United
a test case in 1904, and was decided adversely to the
e Canal employe population has, however, been its best
ngs are held each Sunday morning, and the grand prizes
)0, the larger drawing occurring once a month on the
canal pay days. The lottery is operated under a conces-
a Government, and the drawings are supervised by the

o. This is the highest peak in Panama, 11,500 feet. The volcano has been extinct for many years.

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ceeds derived by the government must by law be devoted
aritable purposes.

NAMA TO HOLD NATIONAL EXPOSITION

th anniversary of the discovery of the Pacific Ocean by
oa occurred on September 25, 1913 (October 5, new style).
this event, Panama will hold a national exposition, open-
914, and continuing six months, to which the United States,
tries of Latin-America, including Cuba and the West

of the Panama National Exposition, Sept. 26, 1913. The ceremony was
nt Porras, assisted by the Bishop of Panama, Dr. William Rojas.

ited. A preliminary credit of $150,000 was voted by the
r the undertaking in 1913. The site is on a natural pla-
ama City, on land purchased by the government for the
tract of 700 acres will be laid for the exposition grounds,
de running east and west, and streets 60 feet wide, run-
The grounds front on Las Sabanas road, and will have
ller entrances, opening into a small park set out with
. In another part of the grounds will be an artificial
t of ground has been made each to the United States and
f buildings, while two other plots have been reserved by
. These building sites are situated one on each of the
nds, and from them a pretty view of the bay, Ancon Hill,
virons may be obtained.

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CIFIC INTERNATIONAL EXPOSITION

31, 1911, the Congress of the United States selected San
.s the most desirable site for the Nation's celebration of the
ing of the Panama Canal, which has been set for January
)n October 14, 1911, in the presence of over 100,000 people,
Jnited States, Hon. William Howard Taft, inaugurated the
reat universal celebration by turning the first spadeful of
o for the Panama-Pacific International Exposition in 1915.
, the President of the United States issued a Proclamation,
ling of the Panama-Pacific International Exposition, and
of the world to take part on a scale befitting their dignity

will open on Saturday, February 20, 1915, and close on
4, 1915, running from Winter to Winter, a period of nine
.

:k originally issued was $5,000,000, divided into 500,000
out owing to the prompt and liberal manner in which
ade the stock was increased to $10,000,000.
appreciation of the honor conferred, and their ability to
and operate an international exposition of this magnitude,
of this capital stock was subscribed by the citizens of San

lifornia by legislative enactment appropriated $5,000,000;
Francisco issued bonds in the sum of $5,000,000. These
ubscriptions, aggregating $17,500,000 in United States
eral fund of the Panama-Pacific International Exposition
on and construction of the Exposition.
California were authorized by the Legislature to levy a
elves of a sum of not to exceed six cents on the hundred
e years, commencing with the year 1911. The proceeds
dual participation by the other fifty-seven Counties of

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s of Marin County rising up into the hundreds and
ousands of feet, with Mount Tamalpais, loftiest of all,
l with a turban of fog upon which the sun shines as
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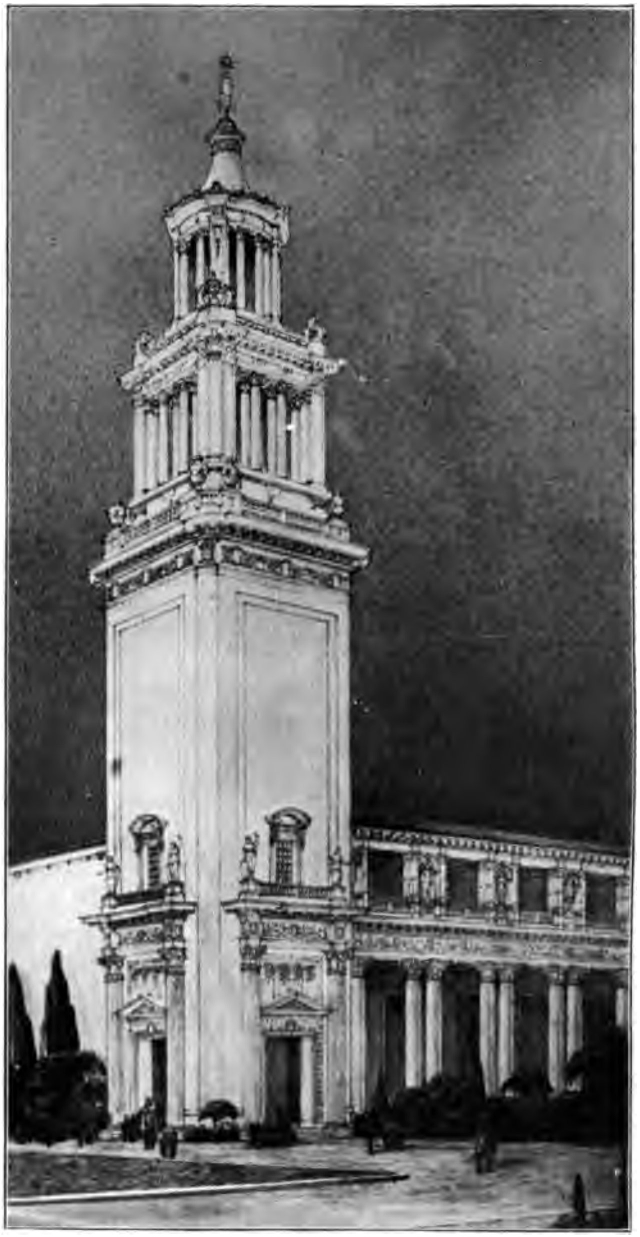

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One of the superb Italian towers that will mark the approach to the Court of Palms. There will be two of these courts, identical in size, one south of the Court of Four Seasons and one south of the Festive Court, which will be known as the Court of Flowers.

exposition grounds. The harbor itself will be a part
hich will be staged the world's jubilee and the Golden
of the theatre.

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The ma

rees and shrubs will lend warmth and color to the esplanade.
he exposition flowers and foliage will contrast with the
ıd peristyles and walls of the buildings, and will enhance
able lagoons, fountains and water effects. The esplanade
"Marina" (villa gardens).
of buildings will lie between a tropical garden or boulevard
st along the fringe of the hills nearest the city upon the
ade along the shores of San Francisco bay upon the north.
d to be known as the "Alameda," will be eighteen hundred
ree hundred feet wide; it will be glowing with fountains,
ristyles and arcades, and, secluded from the winds of the
lanted with a profusion of semi-tropical trees, plants and
orange, banana, olive, myrtle, and every variety of palm.
lameda will open out with a plaza upon Van Ness Avenue,
boulevards of San Francisco. The west end upon the
ounted by a commemorative arch of triumph.
e exposition, its sculpture and mural paintings, will exalt
ent through which America has completed the Panama
there will be observed the most monumental expressions
Occidental and Oriental architecture of the most refined
has ever beheld. The ground will become a vast tropical
den through the transplanting of palms, evergreens and
yet harmonious color scheme has been designed by Jules
greatest authority on decorative coloring in the world.
lor tone of the exposition will be an ochre, a tawny buff,
d from white, but in the distance giving the effect of white,
under the brilliant sunlight of California. In the courts
us blending of colors; Pompeiian red, strong Italian blues,
will predominate. The court system is unique in that
hitect, artist or sculptor to present some distinct concep-
with the exposition architecture and coloring in its en-

of exhibit palaces, facing upon the harbor for 4,500 feet,

ective showing the searchlights anchored in the bay.

THE L

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**Section of th
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Francisco harbc
comprised in a
rounding buildir
rest of the court
designed by Jul**

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As one
Festive Cou
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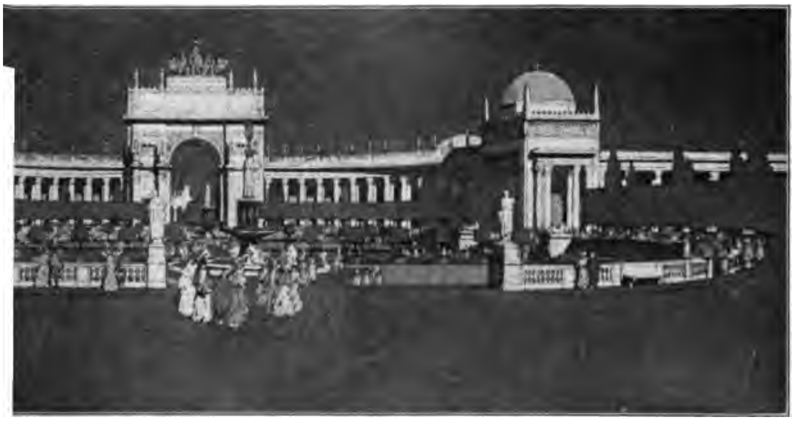
with jewels which will glitter like diamonds when search-
n them. At the base of the tower, which will occupy an
a huge arcade 125 feet high, beneath which the visitor
rt of the Sun and Stars from the south garden.
rchways of the tower itself will be grouped a series of
ned by Jules Guerin and expressing the keynote of the
e. But perhaps the most impressive feature of the Court
be found in a superb classic colonnade extending entirely
surmounted upon the one side by figures to represent the
l on the other the spirit of the West. These figures, of
0, will be fourteen feet in height and each will stand out in
own of dazzling jewels of light.
the court will be a great sunken garden with benches to
le, surrounding the garden. In the garden will be group-



urt of Honor, looking toward the Triumphal Arch that will lead into ourt. The dimensions of the court, exclusive of its opening on San 50x900 feet. One of the most impressive features of the court will be made with columns sixty feet in height screening the walls of the sur- center of the court will be a sunken garden five feet lower than the nd palms in the court, and behind the colonnade great mural paintings ill lend color and imagery to the scene.

y, dancing figures, fauns, satyrs and nymphs; flowers,
ntrast with the statuary and with the superb colonnades
omes.
passes from the Court of Sun and Stars to the great east
a huge triumphal arch 160 feet in height and surmounted
of statuary; camels, elephants and Oriental warriors will
he great arch. To the west on the approach of the Court
be a triumphal arch of similar size, surmounted by a
stern civilization. A huge prairie schooner will comprise
group.
neath either of the huge triumphal arches to the east or
e west or Court of Four Seasons, he will traverse great
exhibit palaces whose sides will be adorned with mural
ned by classic colonnades. Huge pools of water will
he lofty buildings. The walkways will be in pavements

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it grouping of statuary in which Ceres, Goddess of Agri-
lispensing the bounties of nature.

n upon the waterfront will be upon a colossal scale. The
s, opening upon the harbor, will be entered through a
he Gate of Columbus. The visitor will pass through the
eat tower to the esplanade upon San Francisco bay.
ver will be seen a colossal figure of Columbus, facing the
the tower in recesses will be figures representing the great

ce to the great Court of Sun and Stars upon the bay will
hose spiral will depict man's climb toward success and at
umn will be a figure representing achievement. On the

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**conventions of the world will meet. The building will be 380 x 200
280 feet, the latter being taken up by the wings. A vast auditorium
ature of the structure.**

ive Court, will be the gates of Balboa, before which will
the discoverer of the Pacific Ocean.

main north and south courts will open out upon the es-
of San Francisco bay upon the north and upon the great
he south. Vast beds of flowers in bloom will be set in
plants will be replaced by others when their flowering

buildings to be constructed by the exposition company,
neral exhibits exemplifying the advance of the world in
ndustries, will be the loftiest exposition structures ever
he buildings will seem to be assembled as one colossal
high as the average six-story block and with golden domes
ights of 150, 270 and 400 feet. On the east of the rec-

pate in the maneuvers at
a race track where intern
large prizes will be put
of $25,000 for a two-year-

Marking the extreme
stock pavilions and the
and other displays. The G
located here.

Throughout the entire
out the colors of the
color effects. The illumin
purple lights; the windows
Giant batteries of colored sea
site and will play against
high in the heavens. Sea
the main axis of the exposit
palaces, going through more

Old French excavator, which has be
Inter

west of the area of the States and foreign district will be
pable of accommodating at one time ten thousand troops
ons will send their crack cavalry and infantry to partici-
and trials of skill. Encircling the drill grounds, will be
ernational speed and harness races will be held. Many
up; one racing association alone has guaranteed a purse
ar-old trotting race.
eme western limit of the exposition structure will be the
e buildings devoted to live stock, poultry, domestic pets,
he Government Life Saving Service display will also be

ntire exposition the illumination will be such as to bring
ourts in their proper tones, to sharpen and intensify the
mination of the colonnades will be accomplished through
lows of the exposition palaces will diffuse a golden ray.
red searchlights will be anchored in the harbor before the
nst huge jets of steam and smoke that will be liberated
Searchlights 500 or 600 yards out in the water and before
xposition will direct batteries of light over the exposition
more than three hundred evolutions in colors.

, which has been set aside for exhibition at the Panama-Pacific International Exposition.

THE L

The site
Balboa Park,
table land in
fifteen minute
sition ground.
The east
canyon, and
which lend th
exposition en
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At the ea
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many of whicl
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seven Souther
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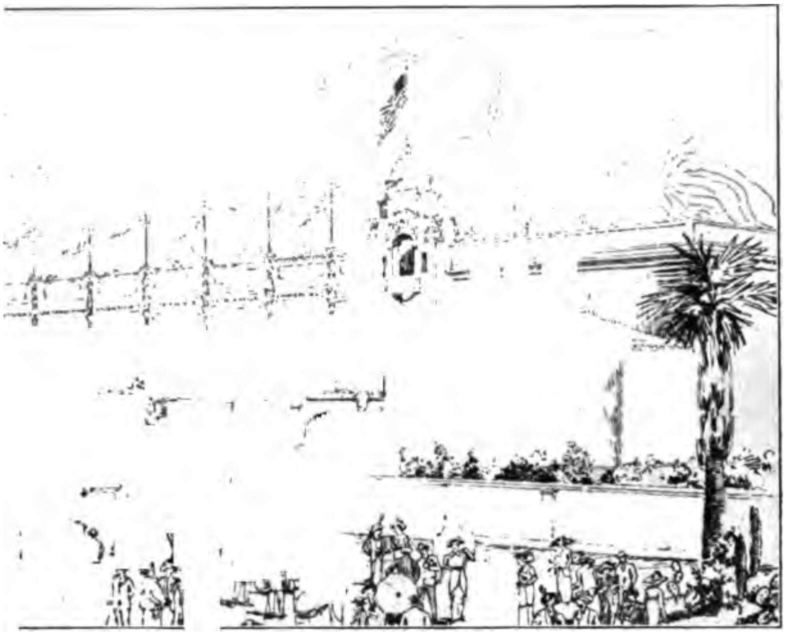
ɘxposition could not have been more happily chosen.
icent fourteen hundred and fifty acre tract, lies on a high
t of the city. To the western gate of the site is about
·om the business center. From any portion of the Expo-
tor enjoys a splendid view of the city and harbor.
ıdary of the Exposition site is marked by another deep
ıds are bisected here and there by small ravines, all of
admirably to the work of the landscape gardener and the
ɔth of whom are taking full advantage of the fact to en-
ıe plans for the Exposition. From the end of Cabrillo
ıteway, stretches the main thoroughfare of the Exposition,
Twice in the distance it is enlarged by plazas. The first



Southern California Counties' Building.

ıe Plaza de California, and the second almost midway
.e Plaza de Panama.
eway the visitor turns to the north, to what is named
hich are situated the sites of the amusement concessions,
eady been allotted. The offering has been so great, that
cessions, under the directorship of H. O. Davis, assistant
ɔllier, has been compelled in self defense, long since, to
nination. The "Isthmus" will enclose, on its course to
the concessions, the villages of the North American
tle Landers farms, the U. S. Reclamation Service, and
nonstrating farm lands, and the outdoor exhibits of the
nia Counties.
ollier believes that the world has tired of the antiquated
' exhibiting "products" as such. He believes that these
tically nothing beyond the fact that man's transportation

THE LAN

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had sent her invitations to the various states of the
ountries, and these had responded in so much greater
rst deemed possible, it was found necessary to greatly
e Exposition. To this end the city has voted an ad-
issue, making the third million dollars raised for Expo-
ity of San Diego alone.
rict recognition and governmental approval, the San
xactly the same position as that at San Francisco; both

Home Economy Building.

"recognized" by the Federal Congress, the invitations
smitted to foreign chancelleries by the Department of
nd immigration laws are suspended by act of Congress,
ns and bonding privileges granted in such cases.
nstitution and the National Museum are co-operating
hibits to secure exhibits of ethnology and archaeology
l, and Congressman Kettner will soon introduce a bill
nents of the government to place their exhibits here as
. Enough exhibits have already been secured to make
s of the Exposition, but there will be no rest until every
will go to make a complete exposition of the history and
man race in America are secured, including the great
t exhibits.

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Culebra
feet of water
that it would l

e but did not admit the water at once. The ladder
gest in the Canal service, was put to work on the remain-
m had a passage through.

f the sole remaining barrier between Miraflores Locks
urred at 9:30 o'clock on Sunday morning, August 31,
resting spectacle. In this dike there had been placed
d 60 per cent. dynamite, distributed among 541 holes at
feet, concentrated in about the center. The blast tore
it as the water in the channel outside was at low tide, it
adually, however, the tide crept up until at 1:35 p. m.
ı the top. At this moment, a man seized a shovel and
he top of the gap through which a rill began to flow.
ı good-sized stream, then to a river, and lastly to a raging
sections of the dike each succeeding moment, until at
the pit 5,000 feet long, 500 feet wide, and 46 feet deep
ap had widened to 400 feet. The end of this barrier
completion of a sea level channel deep enough for ocean-
e way from Miraflores Locks to the sea, a distance of

barrier that at one time kept the water in the Atlantic
ay of Gatun Locks. It was also used as a crossing from
ık. Two pipe line suction dredges began the removal of
ght feet above sea level, and 75 feet wide across the top,
no dynamite being necessary. On October 1, ocean-
able to navigate the Atlantic channel to Gatun Locks.
momentous event of the kind was the destruction of
ıy, October 10, and while the waters of the two oceans
y, it presaged the near approach of that long looked for
ke was built in 1908 to protect Culebra Cut from inun-
e Chagres River. During the flood of December, 1906,
t at Gamboa, but this was before the dike was built and
section of Culebra Cut had been completed. During
1909, the water rose to a height of 72.6 feet, and came
ie dike, which was then at 71 feet above sea level, that
d to fill the Cut with water to the level of the river to
ı case a break occurred. Since that year the safety of
ı menaced. When Gatun Lake rose to over 50 feet in
he dike was widened to an average of 50 feet by dumping
he Cut, and raised to an elevation of 78.2 feet above sea
ut 90,000 cubic yards of material, and in mining for
, a total of 1,277 drill holes were sunk, which if placed
l 41,166 lineal feet. Two hundred of the holes were
ie balance by well or churn drills.

TING WATER INTO CULEBRA CUT

en Cucaracha slide and Gamboa dike, contained 22.7
ike was destroyed on October 10. It was early decided
o allow the Cut to fill from the full head of the flow from

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The first
September 2
Gatun Lake
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trip, Col. H.
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and Mrs. Ge
E. Lee, Capt.
Steamship Li
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On Oct
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entiment expressed in the London Times, "The final
in the history of mankind of which the whole human
ud."

CKS, THE FIRST IN ACTUAL OPERATION

a vessel through a set of the Canal locks occurred on
en the tug Gatun was lifted from the sea channel to the
the west flight. This date was chosen, because of the
mus of Maj. James P. Jervey, who had charge of the
Gatun Locks, and of Maj. George M. Hoffman, who
ing of Gatun Dam, as assistants to their chief, Lieut.-

ower lock was completed at 4:45 p. m., when the sea
e Gatun with flags flying and whistle blowing steamed
el and past the entrance to the lower lock, amid the
spectators. The lower operating gates were then closed,
p alongside the center wall. The process was repeated
at 6:15, just as the short tropic dusk was falling, the
lock for the last lift. This was accomplished at 6:45
gates were swung open, and the tug passed out on the
Gatun Lake, the entire passage occupying one hour and
o save time on the ascent the short length of lock was
rmediate gates into play. The total lift was approxi-
d between the three locks, as follows: Lower Lock, 11.2
feet; Upper Lock, 29.8 feet.
possesses the honor of having been the first boat to pass
anal, is a seagoing tug, with a length of 101 feet, beam
2½ feet. It was built by the firm of Neafie & Levy of
irst named the H. B. Chamberlain. It was purchased
on and brought to the Isthmus in 1906. In its passage
s commanded by Capt. F. F. Stewart, while Mr. W. G.
avigator. It carried as passengers on this memorable
, Lieut.-Col. W. L. Sibert and family, Maj. James P.
y, Maj. George M. Hoffman, Lieut. Geo. R. Goethals,
Henry Goldmark, Mrs. Edward Schildhauer, Mrs. E.
g of the steamship Panama of the Panama Railroad
r. Frank Thompson of the Panama Railroad.
ay, September 27, the Gatun was returned to the At-
ge occupying one hour and 37 minutes.

HE FIRST PRACTICAL LOCKAGE

13, three groups of dredging vessels and a floating
s, a total of 13 vessels, were lifted at one time from the
el to the surface of Gatun Lake, using the entire 1,000-
mber. This performance more nearly demonstrated
commercial and naval use than the passage of the lone
he first group entered the lower lock at 9:50 a. m., and
o Gatun Lake at 12:40 p. m. The first group con-
ith a tow of one 600-ton barge loaded with piles and

have tried to estal
having in mind th
was first given se
gether, let no mar
an excellent test
demonstrated tha
rienced on the Ist

The first tre
and passed unno
seismograph stati
tinued for the spa
their beds and int
the interior town
scale, I to X, an
Ancon seismogra
was done to any
exception of a f
houses. The seis
115 miles to the s
Santos province.
the first severe sh
felt there; severa
Tablas, Macaraca
overturned. At
nearby mountains
American Cable C
Los Santos provin
the ocean, former
4,800 feet, indicat
buried beneath a
to this part of the
tensity has been f
the tower of the c
different times, ar
first laid. It was
break of Septemb
the Isthmus is se
Cartago quake of
here felt in Costa I
A commission, co
W. C. Johnston,
sent to the provin
to make a comple
October 1, the tre
of October upwar

The report of
P. Stearns, Arthu
dolph, John R. F
velt to investigate

ınnection between it and the Canal enterprise, possibly
ıition of the Spanish friar delivered when the project
nsideration, which was "What God hath joined to-
ınder." To the more practical, however, it afforded
tability of the Canal locks and their equipment, and
take a much greater shock than any hitherto expe-
make an impression on the lock structures.

he series occurred at 1:48 p. m., on October 1, 1913,
lthough registered on the instrument at the Ancon
ıe heavy shock came at 11:25 that night, and con-
bout 25 seconds. It brought nearly everyone out of
eets, especially in the cities of Panama and Colon and
movement registered Force IV on the Rossi-Forel
he strongest shake experienced in the history of the
n. Despite alarming reports first sent out, no damage
the Canal work, or to buildings in Panama, with the
ıt cracks which developed in the concrete walls of
ıh indicated the epicenter of the disturbance as being
st, which established it at a point off the coast of Los
ts from towns in this province on the day following
icated that the maximum force of the movement was
s were damaged in the villages of Los Santos, Las
Tonosi, and in two or three towns church towers were
near the seat of the trouble, landslides occurred in the
racks opened in the ground. The Central and South
y's cable broke at a point about 15 miles off the coast of
in repairing the break it was ascertained that the bed of
ıt 1,000 feet below the surface in that vicinity, is now
t the ocean bottom had sunk. The cable was found
ıbmarine landslide. History of the earthquakes local
us shows that in nearly every case the maximum in-
os Santos province. As proof of this, it is stated that
n the village of Los Santos has been overthrown three
this is the third time the cable has broken since it was
on the night of October 1 at the splice made after the
82. It would also appear that the earthquake zone of
and distinct from that of Costa Rica, for the great
as not felt in Panama, nor was the recent disturbance
though there is less than 400 miles of distance between.
of Mr. D. F. McDonald, the Canal geologist, and Mr.
istant chief engineer of the Republic of Panama, was
os Santos at the instance of the Panama Government
stigation of the disturbances. After the hard shock of
ontinued at irregular intervals, and during the month
were recorded, only four of which were pronounced.

ecial board of engineers, consisting of Messrs. Frederic
ıvis, Henry A. Allen, James D. Schuyler, Isham Ran-
, and Allen Hazen, appointed by ex-President Roose-
ı features of Canal construction, which was submitted

ED

THE DA

ground at that
stone church a
stood in the ru
span of over 4
to bring it dov
brethren of St.
It was rebuilt
built its desig
being removed
did not fall.

N

But for C
drawing 25 feet
immediately af
most troubleso
up to the 73-fo
at lake level, tl
Cucaracha. A
of the Cut betw
pick and shove
the ditch almo
by blasting, di
86 was taken t
over the slide.

Secretary
work on Octob
30 he was lift
French clapet
Cut as far as C
an official stat
"I think tl
have seen ever
of one marvel
in feeling the
remarkable wor

The Pana
seas on Janua
probably have
bration of the
participate. T
after paying th
Isthmus to arri

ılon, and along the bank of the Chagres River, and the was destroyed. The flat arch above alluded to has ıto Domingo church for 206 years. This arch has a a rise of two; and it would not require a terrific shock church in which this arch is found was built by the History relates that when the arch was first built it fell. gain, and also a third time. The fourth time it was ɔf the friars, stood beneath while the supports were ıat if it was well made he would not be crushed. It

PASSAGE THROUGH CUCARACHA SLIDE

lide, Culebra Cut would have been navigable for boats ıll the way from Gamboa Dike to Pedro Miguel Locks, ast of October 10. This slide, which has proved the on the Canal, entirely blocked the Cut on October 10 ı that when the Cut between the dike and the slide was vas still about six feet below the top of the barrier at as at once made to pass the water through to the section ide and Pedro Miguel Locks by digging a trench with ıttempt proved futile as the material slid in and filled as it was removed. Sluicing then resorted to, aided much better results, so that on October 20, dredge No. .e Cut from Gamboa and set at work pumping water

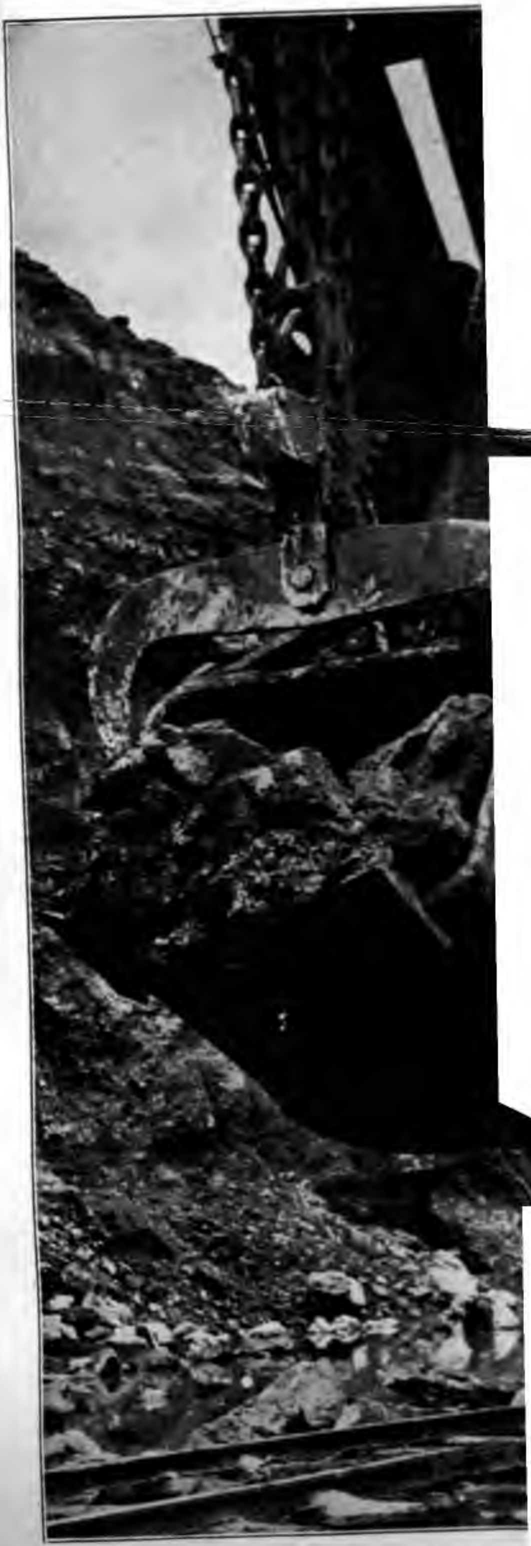
ECRETARY GARRISON'S VISIT

.indley M. Garrison, paid his first visit to the Canal 3, remaining on the Isthmus one week. On October ı Gatun Locks from sea level to Gatun Lake level in .tinuing the trip through the lake section and Culebra ılide in a tug. Before leaving the Isthmus, he gave out ich, in part, was as follows:

ı a work of magnificent import, magnificently done. I ceptible to inspection, and, literally, it is an instance ; to another. The people of our country are justified ·ide in the successful accomplishment of this most

THE OFFICIAL OPENING

will be officially opened to the commerce of the seven ;, although both commercial and naval vessels will ıny times before then. A great naval display in celewhich the fleets of foreign countries will be invited to vill probably assemble at Hampton Roads, Va., and ts to the President at Washington, will sail for the ; for the opening day. It is improbable that all the



Last dipperful of dirt taken out

This and the following three pages show the last ste

rt taken out of Culebra Cut by Steam Shovel No. 226.

show the last steam shovel work in Culebra Cut before the water was turned in.

nball
tom

loaded last dipperful of dirt on last train out of the Cut.

of material out of bottom of the Cut.

Blowing u

This and the foll
channel f

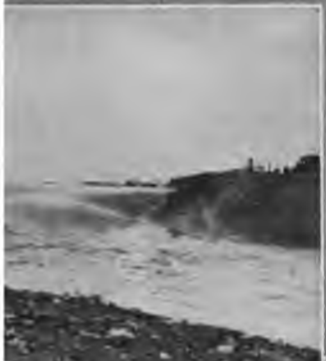
raflores on May 18, 1913. This let water into a completed of the Canal about 1,000 feet long.

ike before the blast of August 31, 1913.

last at Miraflores dike on August 31, 1913.

blowing up of Miraflores dike and the filling of the last part of the sea level res Locks, the entire distance being about eight and one-half miles.

While the wat
for three-quarters
continues. 2. Tl
hung across the fa



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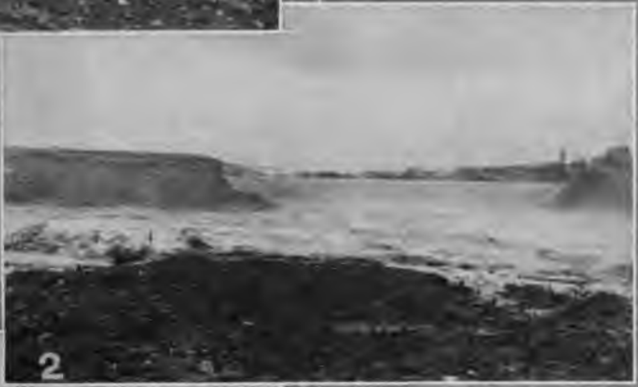

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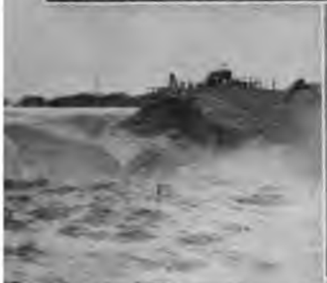

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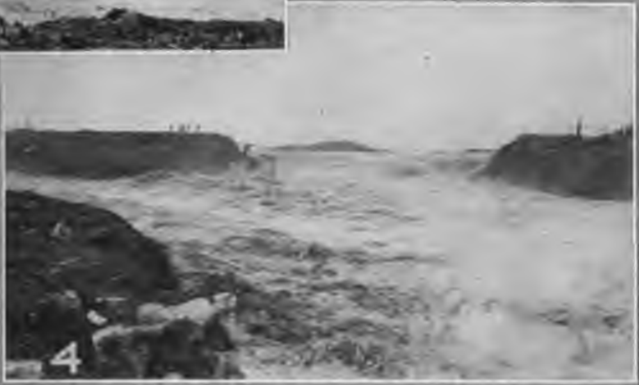
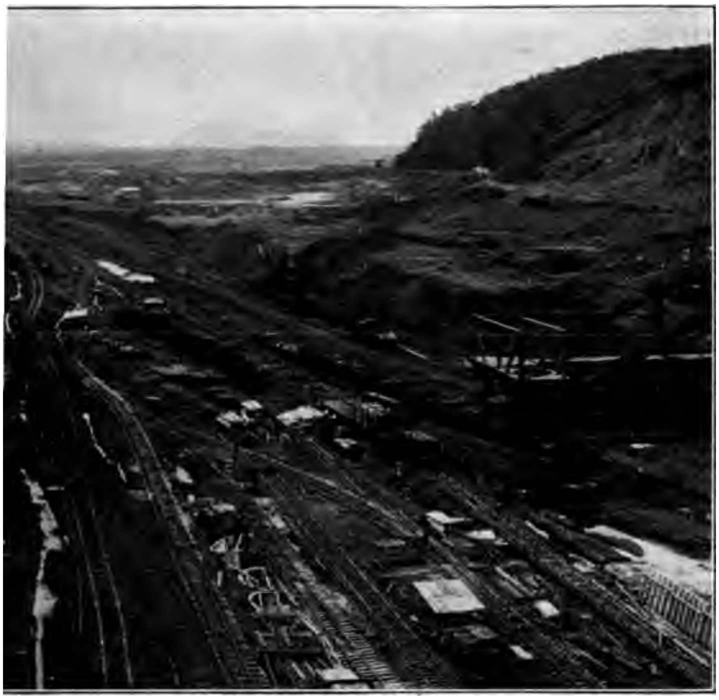


4

into the pit, the phenomenon of the tide being held stationary
vas observed at Balboa eight miles away. 1. The rush of water
out one hour after the water first went through. 3. A steel cable
ish of water thrashed back and forth. 4. The pit is gradually filling.

Excavating in the Ca
was filled by the

View looking sea
the channel completel
flores Locks in the for

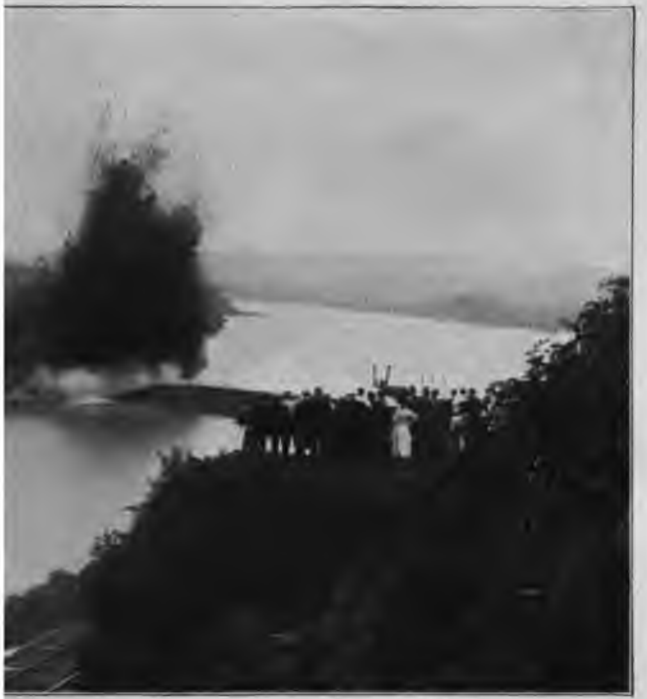


iraflores Locks to the sea. This is the section of the Canal that
of the last dike at Miraflores, shown on the previous pages.

from the same place as the one at the top of the page, sho
ncon and Sosa Hills in the distance. Approach wall of M

Blast that destroyed Gam
feet of

Water from Gatun Lake
The first boat to



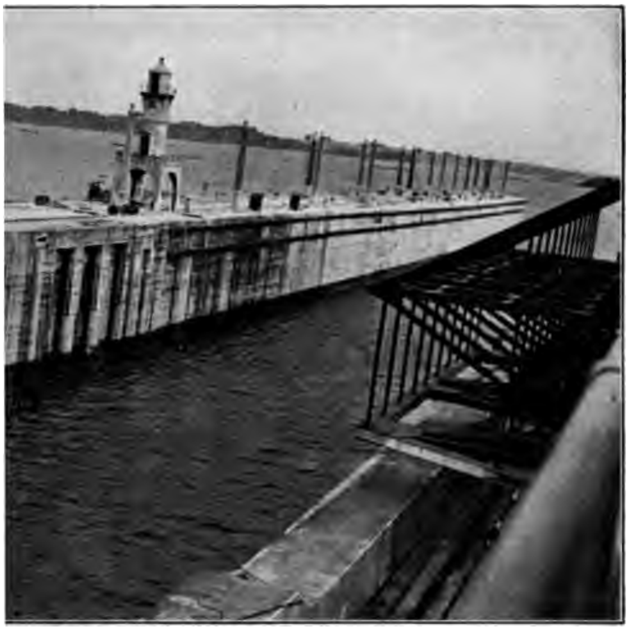
ctober 10, 1913. The Cut had been filled to within a few e lake before the Dike was blown up.

Cut through the opening in the dike after the explosion. t from the lake was a canoe containing two men.

Lake en

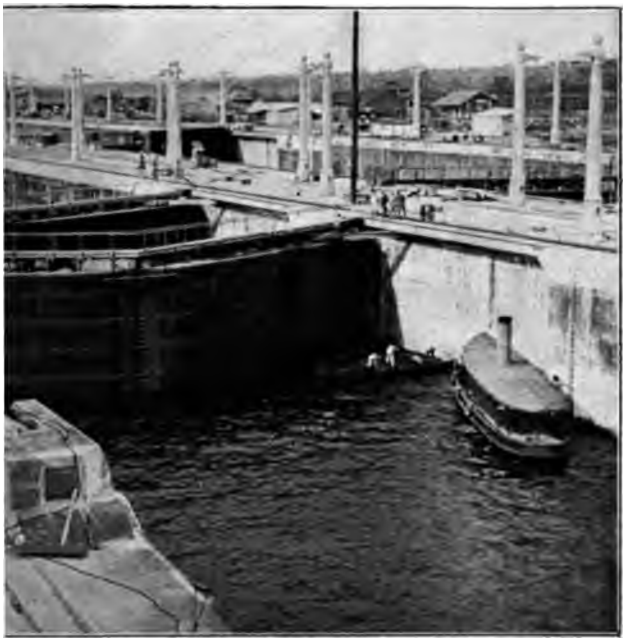
This and the follo
Gat

Lake entrance to
handra



ks on morning of lockage, looking south.

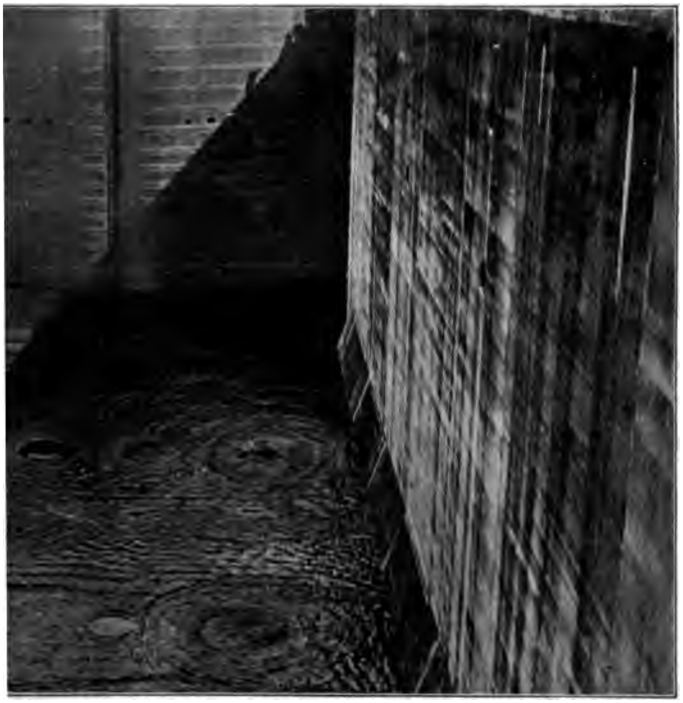
first lockage on the Canal, the tug Gatun, passing through
el channel to Gatun Lake, September 26, 1913.



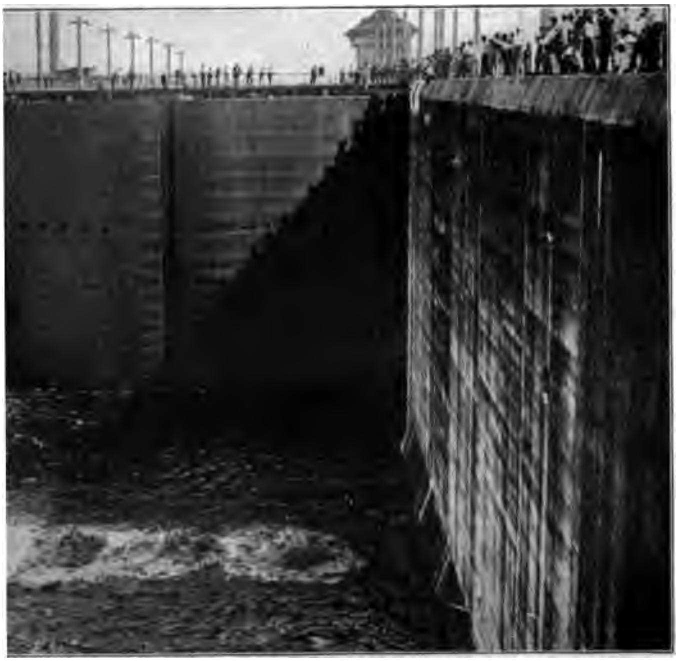
rning of lockage, looking north. Footwalks with
been placed on top of all the lock gates.

Turning water into th

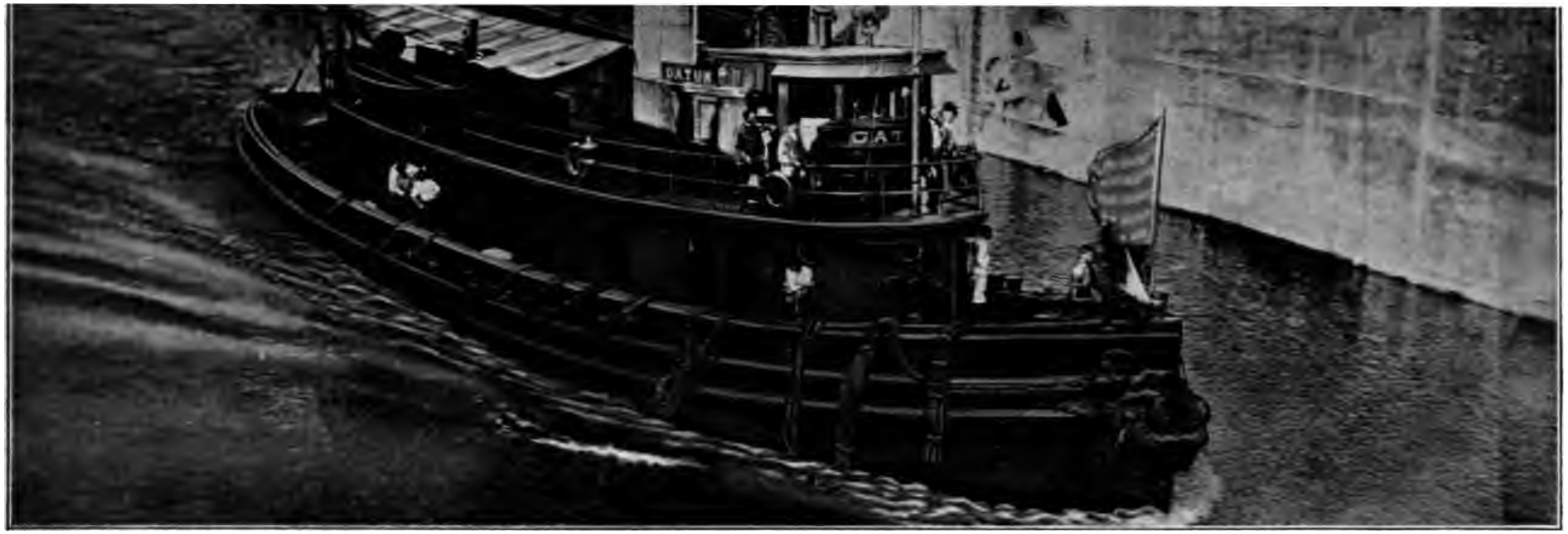
Turning water into t



ıber through culvert openings in the floor—partial flow.



er through culvert openings in the floor—maximum flow.



The preliminary object lesson in the Canal Zone Motto, "The Land Divided, the World United," finds its culmination in the striking illustration given above. The scene shows the first boat to pass through the Gatun locks on September 26, 1913, and pictures the enthusiastic throng of people who are manifesting their joy by cheers as the boat's progress is proceeding through the waterway. To the tugboat "Gatun" was accorded the privilege of making the first passage.

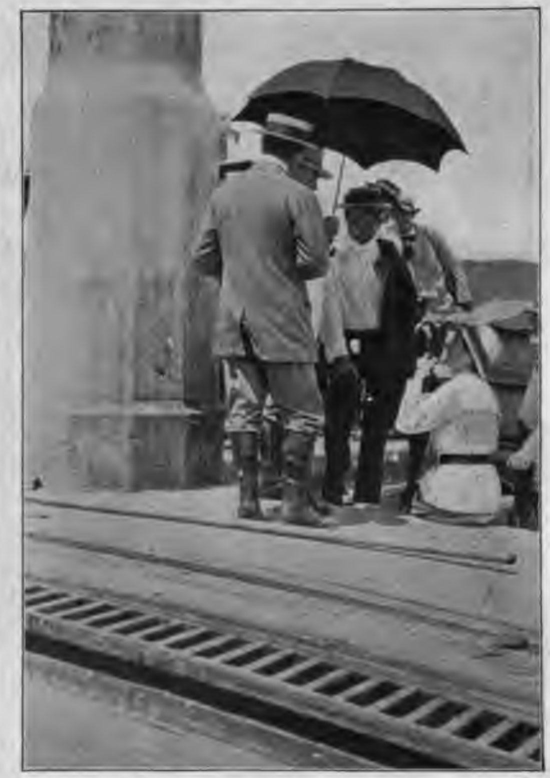
tering the lower lock chamber.

ning up the lower lock chamber.

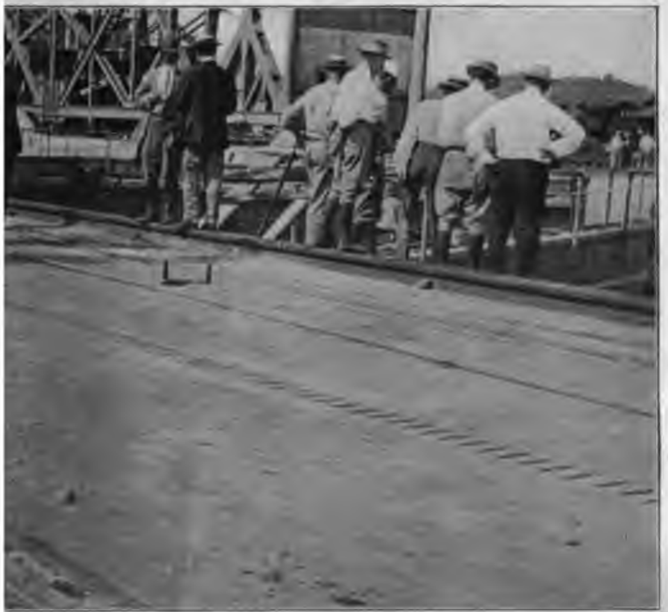
Colonel Goethals an

Col. Harry F. Hodges

ctator.



Colonel Goethals is amused. Group includes Mrs. H. H. Rousseau, sitting; Mr. Joseph Bucklin Bishop, with umbrella; Mr. Rousseau, back turned.

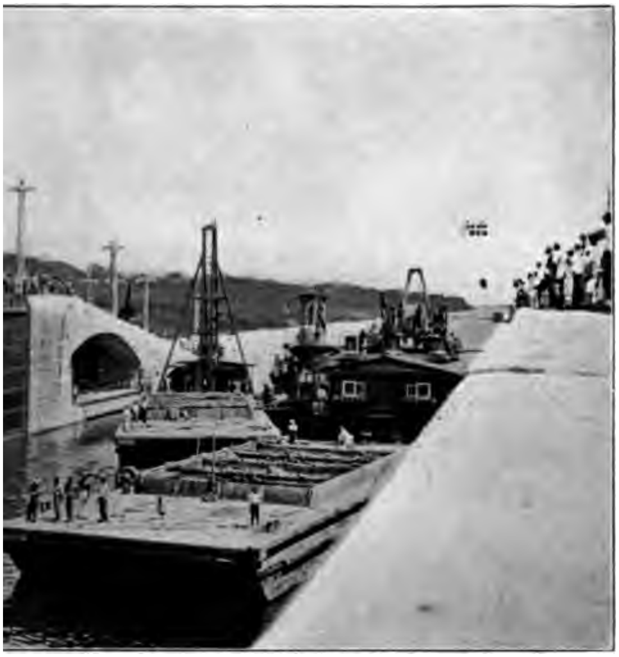


nd Lieut.-Col. W. L. Sibert (right facing) talking it over.

Tug Empire, and
pile

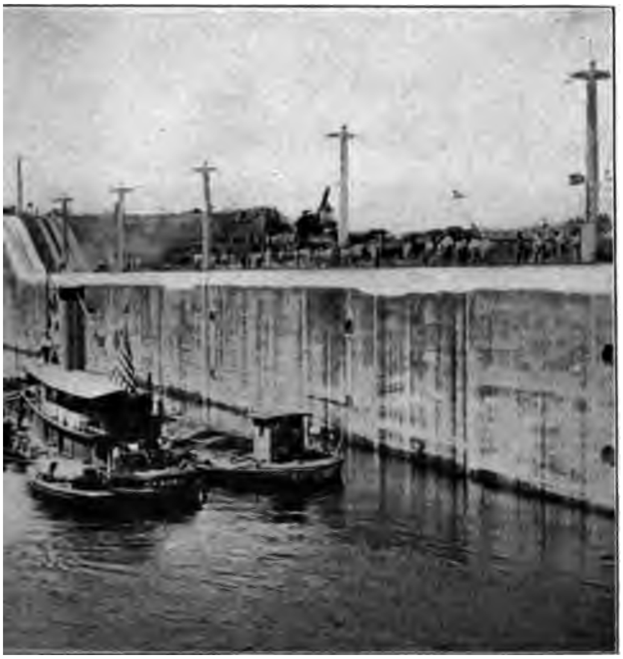
This and the following fou
passing from th

Tug Bohio and



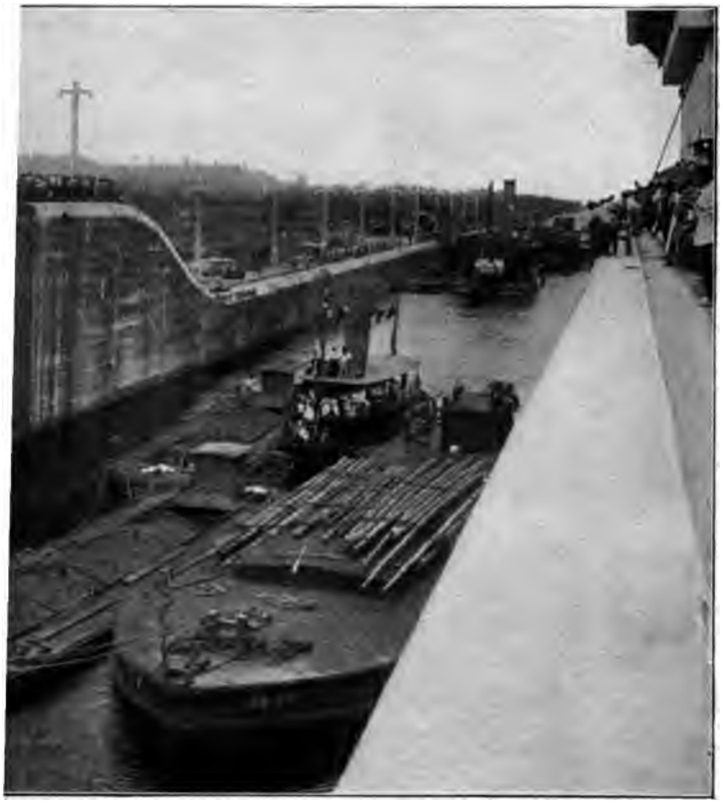
dder dredge No. 5, two dump scows and floating e lower approach to Gatun Locks.

practical lockage at Gatun Locks, tugboats, dredges and barges Gatun Lake, October 9, 1913, combined lift of 85 feet.

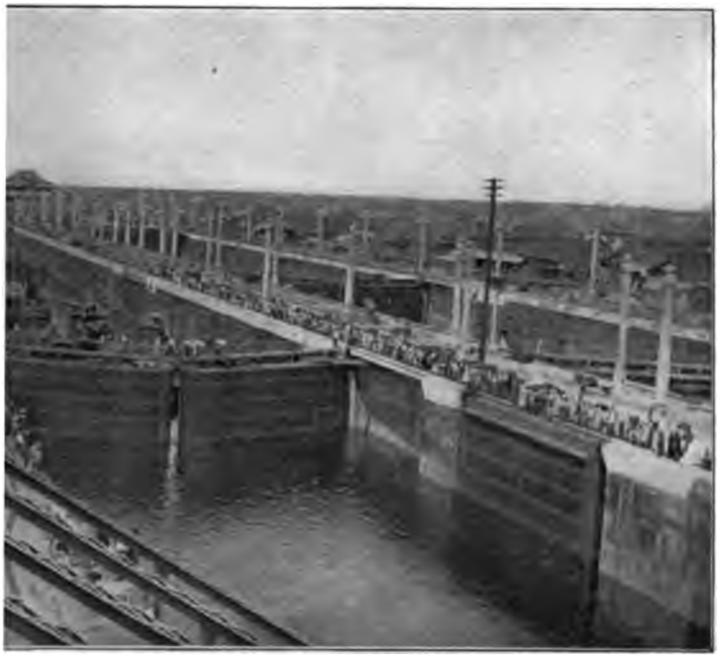


ng of three loaded barges in the lower approach ing for the gates to swing.

Opening the middle



ft from the lower to the middle lock.



he fleet, 13 vessels in all, nearly fill the lower lock chamber.

Assembling the vari

Tug Empire, with t
are floating islands, mass
lake by the wind.

the middle lock. Colonel Goethals on the lock wall
ght with his back turned.

into Gatun Lake. Dark spots on the surface of the lake
;etation lossened by the lake rise, and blown across the

Inside the upper lock.

Opening the lower

This and the following page show the first loc
from Miraflores Lake to Culebra C
Miguel Locks is 85 fe

rd gate to admit the floating equipment.

at Pedro Miguel Locks, October 24, 1913, the dredging fleet being lifted
lift of 30⅓ feet. The combined lift of Miraflores and Pedro
e same as at Gatun Locks on the Atlantic side.

ge No. 85 entering the east lock chamber.

French clapet No. 4 in
i

Culebra Cut at Gold Hill
foreground and the f

west chamber at Gatun, carrying Secretary of War Garrison
hrough the Locks on October 30, 1913.

ring the French canal times. The space between the shed in the
locomotive is the zone of activity of the Cucaracha slide.

**Close view of Cucar
the slide blocking the Ca
projecting into the Cana
which moved some dista**

This and the following two

**Closer view of trenc
open in the spongy mass
discouraging task, for th
while these operations w**

lagoon in the foreground was formed by another part of the picture ends. In the distance may be seen two points ıe toes of the slides on the east and west banks at Culebra, vas admitted to the Cut.

ɔn Cucaracha slide, after the water was allowed to enter Culebra Cut.

t the slide. Workmen engaged in trying to keep a trench from filled section through. This proved to be a most about as fast as dug out. Two workmen were drowned

View of the Cut ab
in the distance working
through the entire Can

rth through Cucaracha slide.

h of Cucaracha slide. Dredges No. 85 and 86 may be seen
d north sides of the slide, the last barrier to a passage

which is his just due. H
ceeds will grow brighter
will be his rich reward

It seems beyond th
marvelous resources an
years were in evidence i
sighted either in enterpri
pathway between the o
Thus we may be permit
prediction that America
responsibility and meet
the future may present i

In order to be able
future will be carried th
more entertaining nor o
business associations of
that is actively stirring t
old systems and ancien
Isthmus, but when the
scene the artisans of our
and victory came into
their glory. Our people
now so completely won.

In connection with
the construction of the P
absence of suspicion an
those prosecuting the w
absorbing task were relie
or dishearten, from the
finally achieved the un
observed in everything p
prominently before the p
ment of the greatest de
always been within the
concerning the construc
Canal will long be a wor

The monumental ta
will doubtless be searchi
but the eloquent theme
stand out in the chronicle
a manner to excite emula
preciating the great thin

No work of consequ
is anything of value se
undertaking on the Isth
disease, anxiety and unc
ture. These problems h
superb skill, indomitable
more can be said, and, i
nothing more is necessa

lid capability, always in evidence, as time pro-
the cordial commendation of his countrymen
fe.

of doubt that a nation which displayed the
sted the almost illimitable power which for
struction of the Panama Canal will be short-
cking in initiative or invention in utilizing the
which now has been so adequately provided.
the closing stage of our volume to hazard the
rprise and American ambition will fulfill every
expectation in utilizing the opportunity which
ing ourselves of the advantages at hand.

p the possibilities of the trade which in the near
the Panama Canal, there should be no subject
e profitable that can engage the attention of the
untry than to obtain a knowledge of the topic
rgies of other nations. Monuments of ruins of
ods may be observed on every hand on the
wand of American courage was waved over the
y were equal to every call; obstacles disappeared
permanently reside as a sentinel proclaiming
rely not be slow to seize the fruits of the victory

ny gratifying words inseparably associated with
Canal it is especially fitting to note the complete
dom from both scandal and graft from which
rom the beginning to the completion of the
In addition there has been but little to discourage
point of adverse criticism, the workmen who
led success, since the frankest manner was
g to the enterprise, and this policy has been kept
Daylight has been a factor in the accomplish-
all history and candor and honest motives have
nd was revealed to any who sought information
ork in hand. In this particular the Panama
ample of sincerity and open-mindedness.

ver, and the enterprise of the American people
ew fields to conquer, new obstacles to overcome,
construction of the Panama Canal will forever
e world as a marvelous undertaking, executed in
d compel the admiration of those capable of ap-
is world.

s ever brought to completion without effort, nor
without labor and sacrifice. The tremendous
was colossal in many ways, involving danger,
y, as well as millions upon millions in expendi-
en encountered and have all been mastered by
stence and heroic courage. In a word, nothing
onnection, as a final leave-taking to the reader,
ay.

CA
Chiriqui
Boquete
David
PACIFIC
C A
Pt.Diego
Lagarto
Area of Gatun Lake
Elev.+85 Ft., 163.38 Sq.
9°00'
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ISTHMUS W

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PRONOUNCING G
MOST FREQUE
PANAMA, T
AND AI

Agua Clara (ä-gwä klä'r
water. Name applied to sev
Isthmus on account of the
waters. Name of tributary
also of the Zone waterwork

Aguadulce (ä-gwä-dool'sy
water. Name applied to s
localities on the Isthmus.
potability of the water. N
supplies Toro Point settleme
name of thriving port on
province.

Agua Fria (ä-gwä free'ä),
ning water. Several streams

Agua Salud (ä-gwä sä-lo
number of small streams
classed as health-giving, or
Name of stream in the Gatu

Ahorca Lagarto (ä-or'-ka
literally "hanging lizard,"
from the number of large li
limbs of trees in this locali
on the old line of the Pa
miles from Colon. Now i
Lake.

Alhajuela (ä-lä-wā'lä),
jewel." Place on the Cha
from Gamboa, where a gag
tained by the I. C. C.

Almirante (ăl-mee-răn'tee
miral." Name of town fou
Fruit Company in Bocas de
its permanent headquarters.
in the same locality, from th
bus, who discovered it.

Alto Obispo (ăl-tō ō-bees'
per bishop." Called by t
Obispo." Name of native
Obispo on the old line of t
doned on account of Gatun

Ancon (ăn-kōne'), meani
roadstead." Name applied t
looking Panama and Panan
also called "Cerro de los B
the Buccaneers), from the
gan and his man first saw
height. Name also of the A
at the foot of the hill.

Arraijan (arr-ä-ee-hän'), s
Spanish "arraigado," plac
Name of Panamanian villa
Zone boundary line west of
its orange grove.

Barbacoas (bar-bä-kō'as),
from Spanish "barbacoa,"
locality on old line of the P.
from Colon. Also applied
bridge which formerly sp
River at that point.

Bas Obispo (bäs ō-bees'pō
bishop," in contradistinctio

R OF THE GEOGRAPHICAL NAMES ARD IN THE CANAL ZONE AND WITH THEIR APPLICATION, OLOGY, WHERE KNOWN

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American settlement on old line of the P. R. R., 16 miles from Panama. Site of the United States Marine Camp (Camp Elliott) for many years. Town will be abandoned.

Bayano (bä-yä'nō). Origin of name undetermined. Name of one of the large rivers of the Isthmus, emptying into Panama Bay, sometimes called Rio Chepo, famed for its alligator haunts. Also name of tribe of Indians that dwell along the upper course of the stream.

Bocas del Toro (bō'kas del tō'rō), meaning "mouth of the bull." Name of city and province developed by the banana industry, which is wholly in the hands of the United Fruit Company. Annual shipments from this locality now amount to about 7,000,000 bunches.

Bohio Soldado (boo-ee'ō sōle-däd'ō), meaning "soldier's home." Name of a once thriving village in the Canal Zone, 15 miles from Colon. Site now covered by Gatun Lake. Was the largest village in the Zone when the Americans acquired the strip in 1904.

Boqueron (bō-kāy-rōne'), meaning "wide opening." A tributary of the Rio Pequení, rising in the mountains near Porto Bello. Also a village in Chiriqui province.

Boquete (bō-kāy'tāy), meaning "A gap, or narrow entrance." A rich valley in the mountains of Chiriqui province, inhabited by a foreign colony engaged in the growing of coffee. Many American employes have been accustomed to spend their vacations there.

Buenavista (bwä-nä-vees'tä), meaning "good view." The name of several localities on the Isthmus. Formerly, a hamlet on the P. R. R., in the Gatun Lake area.

Caimito (kä-ē-mee'tō). Name of an Isthmian vegetable. Also of a small stream in the Canal Zone, and of a station on the new line of the P. R. R., 26 miles from Colon.

Caldera (käl-dāy'rä), meaning "Caldron." Name of a river, village and hot springs in the province of Chiriqui.

Calobre (kä-lō'brāy). From the Spanish word "**Calor,**" heat. Name of village in Veraguas province, near which are three hot springs.

Camacho (kä-mä'chō). Origin of word undetermined. Name of stream in the Canal Zone. Also applied to Zone waterworks at Empire.

Cana (kä'nä), or **Santa Cruz de Cana** (sän'ta kroos day kä'na). Name of a settlement in the Darien region, headquarters of the Darien Gold Mining Company, Ltd.

Cascajal (käs-kä-häl'), meaning place full of gravel or pebbles. River, emptying into the bay at Porto Bello.

Cerro Grande (cher-ro gran'de), meaning big hill. Spanish name of Balboa Hill, the highest point in the Canal Zone, over 1,000 feet, situated a few miles from the old site of Gorgona.

THE LAND

Juan Mina (hoo-än mee'
Mine. Small settlement nea
Chilibre River on the Chagre

Las Cascadas (las käs-kä'd
Cascades.'' American settl
line of the P. R. R., 15 mile
transportation headquarters
vision for several years. Wi

Los Santos (los san'tōe
Saints.'' Name of provin
Panama, and also of its capi
Santos, ''The Village of tl
was formerly important, but
by Chitre, its port. This pr
ter of the earthquake shocks

Majagual (mä-hä-gwal').
jagua, a tree of the linden
tive town in the Canal Zone,
from Cristobal.

Mamei (mä-mäy'ee). Nam
also of a former settlement i
the old line of the P. R. R.,
area.

Mandingo (man-din'gō).
the Canal Zone, which passe
Obispo and enters into Gatu

Mandinga (man-din'gä).
Blas coast of the Isthmus.

Manzanillo (man-sä-neel'y
the number of **manchineel,**
merly found in the vicinity.
a juice, which, falling on a
tating sores. Name of islan
of Colon stands, now conne
land by a broad fill, so that
more. Also name of a bay

Matachin (mä-tä-cheen').
Spanish word **matar,** to exe
posed to be a word coined f
chino, Chinaman, on account
sive number of suicides sai
among the Chinamen at this
Chinese labor was employed
the Panama railroad. This wo
dispute than any other loc
to the above definition say
''butcher.'' Name of a for
line of the P. R. R., called
the French, Bas Matachin, b
Americans to Matachin. Pl
the rise of Gatun Lake.

Mindi (min'dee). Origin
Name of a river near Colon
range of hills cut through
trance to the canal.

Miraflores (mee-rä-flō'res),
the flowers.'' Name given
lake, and a station on the P.
from Panama. The town its
on account of the lake. At
the new Panama waterwork
on the line of the railroad
here.

Monte Lirio (mōn-tāy lee
Mount Lily. Station on t
P. R. R., 14 miles from Co
bridge over the Gatun Rive

Naos (nä'ōse). From the
ship. One of the group of
Bay, owned and fortified b

Connected with the mainland by a breakwater and causeway.

Nargana (nar-gä'nä). Indian village on the San Blas coast of Panama, headquarters of Chief Charley Robinson, head of a branch of the San Blas tribe.

Nata (nä-tä'). One of the oldest towns on the Isthmus, situated in Coclé Province. Contains the oldest church that is still in use.

Nombre de Dios (nōme'brāy dāy dee'ōse), meaning "Name of God." One of the early towns of the Isthmus, situated on the north coast, about 35 miles east of Colon. From this point was obtained the greater part of the sand for building Gatun Locks.

Palo Seco (pä-lō sāy'kō), meaning "Dry stick." A point on the south coast, a short distance from Balboa, where the leper settlement is located.

Panama (pä-nä-mä'), meaning, according to tradition in the early Indian tongue, an abundance of fish. Capital and chief city of the republic, situated on Panama Bay, on the south side of the Isthmus.

Paraiso (pä-rä-ee'sō), meaning "Paradise." American settlement in the Canal Zone, about eight miles from Panama, closely hugging the banks of the Canal. Permanent dredging headquarters will be here.

Pearl Islands (Islas de las Perlas). A group of about 115 islands and islets situated in Panama Bay, about 50 miles from the port of Panama. Largest is Rey, 8 miles wide and 15 long. Mostly noted for their pearl fisheries.

Penonomé (pāy-nāy-nō-māy'). Probably from the Spanish word **penoso**, so-called on account of the Feast of the Penitents formerly held there by the mountain Indians, who, on the principal day of the feast, would flagellate themselves until the blood streamed down. This ceremony has recently been prohibited by the Government of Panama. It is an interesting little town, the capital of Coclé Province, and the home of some of Panama's most prominent men.

Pequeni (pāy-kāy-nee'). One of the principal tributaries of the Chagres River, flowing through a rich alluvial country.

Perico (pāy-ree'kō), meaning paroquet. One of the group of islands, four miles out in Panama Bay, which the United States has purchased and fortified.

Porto Bello, or **Puerto Bello** (por-to bel-lo, or pwer-to bāl'yo), meaning "Beautiful port," name bestowed on the place by Columbus on account of its magnificent haven. It is one of the oldest towns on the Isthmus, at one time the Atlantic terminus of the great trans-Isthmian trade route. Small native town and ruins still exist. Across the bay is the American settlement established on account of the neighboring rock quarry, from which the rock was obtained for the concrete in Gatun Locks, as well as for the armor of the west breakwater in Colon Harbor.

Punta Mala (poon'ta mä'la), meaning, literally, bad point. The name of a cape and headland on the south coast of Panama, marking the westerly limit of the Bay of Panama. Small ships give it a wide berth.

Rio de Jesus (ree-ō dāy hāy'soos), meaning, literally, "River of Jesus." A picturesquely

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